RESIDENTIAL PATTERNS AND SOCIAL CHANGE: WOLVERHAMPTON 1851-1871

MARK SHAW

Thesis submitted for the degree of Ph.D. Department of Geography University of Birmingham, 1977

SYNOPSIS

It is argued that the three keys to an understanding of urban residential patterns are the functional differences between zones (in terms of the social groups served), their spatial pattern, and the processes of change which they experience. A review of the literature shows that a theory and a related technique which integrate all three elements are slowly emerging. As a stimulus to this development, a stage model is presented which summarizes the evolution of urban residential patterns. This suggests that the process of industrialization/modernization involved an evolution in the dimensions of residential differentiation. This hypothesis is examined using Census Returns for nineteenth century Wolverhampton. Comparison of factorial ecologies for 1851, 1861 and 1871 provides strong evidence for this type of temporal change. As a step towards the incorporation of spatial patterns within this conceptual framework, an attempt is made to map the quality of the residential environment in nineteenth century Wolverhampton. Changes in the dimensions of residential differentiation are linked with the movement of the high status groups to more attractive suburban homes for, in leaving the town centre, they often forsook the complex household patterns associated with domestically organized trading activities.

About 113,000 words

DEDICATION

To my parents

ACKNOWLEDGEMENTS

I should like to thank Mr. Michael Tanner for his supervision of the research reported here and for the patience and care with which he read and commented upon earlier drafts. Thanks also to M/s Sue Hughes who typed this thesis and to Mr. John Dixon and Mr. Geoff Hodgson who drew the diagrams.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION: STUDYING URBAN RESIDENTIAL PATTERNS

.1 The Philosophy Of The Present Study

The potential of essays in urban residential geography is rarely realized because each can only be considered in isolation. An urban historical analysis which, though excellent in itself, lacks referents beyond its own parochial purview remains just another study. The results stand for themselves and no more, having little more general relevance. Moreover, the type of theoretical framework which might offer such relevance is absent or "at best" disjointed and ill-defined, as Dyos (1968) shows. The researcher therefore wanders around his own particular town, gazing in amazement at each local idiosyncrasy that catches his eye. Handlin (1963, 26) even advocates such an approach: we should "focus upon a city specifically, in all its uniqueness". This method, it is argued here, tends to lead the researcher astray; absorbed by the oddities he has uncovered, he forgets that only by reference to a wider sphere of knowledge can his findings have more than curiosity value and resorts to inductive hoarding of countless facts of uncertain relevance following an idiographic rather than a nomothetic method (Harvey, 1969, 50). Clearly, a theoretical framework is needed to organize and co-ordinate research.

Ideally, a deductive system of the type described by Braithwaite (1968) is required. In such a system, if the highest level hypotheses are taken as premises, all other hypotheses logically follow. The pinnacle of achievement is the axiomatized system (Popper, 1968) with a minimum number of independent and consistent premises which are both sufficient and necessary for the deduction of all lower order statements. While urban residential geography is unlikely to produce a complete deductive system at present, a set of related generalizations is essential to future progress in the field.

A conceptual framework of this sort serves several important functions in the advancement of understanding. First, it provides a criterion for selection (Medawar, 1969, 29). Research requires good reason for making one set of observations rather than any other; data collection is easily co-ordinated if all information must be relevant to the testing of explicit theory. In the absence of any guiding principle, each individual flounders in his own sea of confusion with little idea of the direction in which advancement lies, as Davies (1966, 128-30) demonstrates. The second important function of an explicit theoretical framework is to make clear the relevance of a wide spectrum of research to the central theory. Given an ordered system of propositions defining the present state of knowledge, it is simple to classify research findings into one of three groups: (a) those which conform with existing theory, (b) those which conflict with existing theory, and (c) those which are not relevant to the testing or extension of existing theory. Stemming from this is a third function of the framework: to provide for the reformulation of existing theory when a large body of evidence is found to conflict with established thought. Knowledge rarely advances by the total rejection of all previous ideas - theory is repaved not refuted. A structured system of propositions makes this process easier, isolating aspects of theory which require modification from those which may continue to serve in the modified framework.

A fourth function of the theoretical framework also merits attention for its relevance to the study of urban residential patterns during rapid urban growth - the subject of the present thesis. A concise theoretical framework facilitates the transference of ideas to, and may hasten the progress of research in, related areas of interest. It is not suggested that the changes described here as characterizing the rapid urban growth of one nineteenth century British town are directly relevant to modern cities undergoing population explosions in the Third World (- indeed

Peach (1968) stresses the differences -) but an improved understanding in each has implications for the other. A limited parallel between the two is generally recognized (Anderson, 1959-60, Adelman and Morris, 1975) and so it is useful to apply a conceptual framework developed in a nineteenth century context to the Third World. This may highlight key differences, indicating aspects of either situation which warrant closer scrutiny. Without a theoretical framework it is difficult to detect similarities and differences, and to avoid duplication of research effort. Chorley (1964) considers the value of such "analog models".

.2 Components Of An Overall Conceptual Framework

Once the need for a sound theoretical framework is acknowledged, it is necessary to specify the essential elements of such a framework, so that it may be correctly elaborated before analysis begins. The urban residential system may be conceived as an aggregate phenomenon with two major components: "people" and "places". The "people" are the various social groups which form recognizably different sub-sets of the urban population, and the "places" are the many residential areas which are differentiated in environmental terms. Urban residential patterns arise from the allocation of the different social groups between these residential areas. Unfortunately many past examinations of urban residential structure have been content with this simplistic view, neglecting the role of temporal change ("process") in the types of social group and in the types of residential area present in the city. The various social groups are defined by the processes of social differentiation operating in society, while the varied residential areas are defined by processes of spatial differentiation at work in the city. Only a recognition of the importance of change in the processes of social and spatial differentiation can provide a full understanding of urban residential patterns. The conclusions of Eichenbaum and Gale (1971, 541), regarding their preferred methodology in geography, are relevant here.

(a) "A metaphysic which postulates continual change is preferable to one which presupposes a permanence in things. While such speculation is unprovable ..... we seem safer with the former in that it embraces the latter as a special case, where change is imperceptibly slow."

(b) "It follows ..... that geographic methodology must encompass more than a form-function approach. To ignore process is to ignore the essence of change. If process is only considered to the extent that it is logically deducible from form-function investigations, we ... risk ... false conclusions."

(c) "Form-process and process-function methodologies, though ... fresh viewpoints ... are similarly limited in that they, too, ignore an essential characteristic of reality."

(d) "We thus suggest a form-function-process approach to geographic problems as a means of establishing tenable explanations and predictions. As "followers" we have the security that such a methodology is firmly entrenched in the more successful physical and biological sciences. Our own faltering steps towards such an approach have at least pointed to the fallacious conclusions which could be reached ..... (with) a more restrictive methodology."

It is argued here that (to use the terminology of Eichenbaum and Gale) a "form-function-process" approach is likely to prove most fruitful for the study of urban residential patterns. Indeed these terms offer a convenient shorthand, and it is useful to define the way in which they will be applied to the urban residential system. 'Form' in this context, refers to the spatial arrangement of the various types of residential neighbourhood - their pattern, or distribution. Form thus stems from the allocation of social groups to those residential areas defined by the processes of environmental or spatial differentiation at work in the city. 'Function' indicates the role of such areas in housing particular social groups; hence the functional component of the residential pattern is defined by the processes of social differentiation operating within the urban populous. Though the term may suggest a functional view of urban residential subcommunities (Buckley, 1958), stressing concensus and co-operation, it is used without prejudice to the alternative conflict view (Boal, 1972). Finally, 'process' is used to refer to temporal change in either or both of the other components.

A conceptual framework embracing form, function and process is essential for a better understanding of urban residential patterns. But it should not be thought that such a framework is wholly absent. On the contrary, a form-function-process view of urban residential structure is slowly emerging, though at present beset by inadequate conceptions of 'process'. When elements of change are incorporated they are generally confined to those aspects of process which produce, and explain, immediate formal or functional arrangements. There is rarely a wider view of change, encompassing form-function patterns other than those obtaining at the present time. Hence Burgess's (1925) urban structure model invokes the pressure of outward growth to explain the development and extension of concentric functional zones in modern cities, and assumes a general preference for new housing in a semi-rural environment to explain the peripheral location of high status zones. There is no provision for a pre-industrial situation with high status groups centrally located, so the model defines a special case and is valid only given particular conditions. Other current views of urban residential structure share this fault: 'process' is too narrowly conceived, and generalizations are temporally constrained. In brief, most ideas about residential structure refer narrowly to one short period - often that occupied by the modern industrial city. It is therefore necessary to widen the range of applicability of theory, and it is to this end that the present work is addressed.

.3 The Central Hypothesis Of The Present Study

Recognition of the narrow temporal referents of current views of urban residential structure stems from a growing realization that findings regarding the pre-industrial city conflict with generalizations based on modern industrial cities. In terms of both formal and functional organization the two seem to have been different, and generalizations are required which allow for (and explain) these differences. It is the central

hypothesis of this work that residential differentiation in the modern city is qualitatively, as well as quantitatively, different from that in the pre-industrial city. More specifically, it is contended that the dimensions of social differentiation which define the functional aspects of the residential system were markedly dissimilar. At this point 'process' is crucial. Instantaneous revolution is inconceivable - some evolution must have occurred. It is therefore suggested that there was a rapid transition between these two states during industrialization and urban growth.

The conditions obtaining before, during and after this change must obviously be specified in detail before the hypothesis has any empirical meaning, but the essential point is clear. Two formerly isolated and apparently conflicting states of the urban residential system are reconciled in a single transition model of social evolution and urban change. The present study is devoted to the elaboration of this hypothesis and to its testing.

.4 A Methodology For Hypothesis Testing

Of key interest is the methodology to be used for testing the central hypothesis outlined in Section .3, and the present study depends upon the developing factor ecological approach. The reasons for this are elaborated in Chapter 1, but the major value of the factorial approach stems from the way in which it allows all the three aspects of form, function and process to be analyzed together. Initially, temporal evolution was only clumsily incorporated within this methodology, but recent advances in analytical techniques allow temporal comparisons of factor structures which provide a firm basis for testing hypotheses suggesting a historical evolution in the dimensions of residential differentiation. Despite its virtues, however, the factorial approach does have limitations and it is one of the objectives of the present analysis accurately to define these. Of particular concern

are the limitations of current factor comparative approaches and of the factor ecological approach itself within a historical framework. Only when the advantages and limitations of existing techniques are fully appreciated will newer, more appropriate methodologies be developed.

.5 Testing The Hypothesis: Wolverhampton And The Enumerators' Returns 1851-1871

Testing hypotheses of the type described in Section .3 is a complex procedure. The narrow time-base of current ideas about urban residential structure seems less surprising once the difficulties of hypothesis testing within a wider temporal context are acknowledged. Quite apart from the technical problem of analyzing a city whose size increases dramatically during an extended study period, it is unlikely that comparable data will exist for a single city through its pre-industrial, industrializing and modern stages. On reflection, however, the industrializing phase appeared to hold the key, for if the hypothesis were correct the industrializing city should - within a relatively short period - undergo profound changes taking it away from the hypothesized pre-industrial pattern and towards the modern one. Data requirements were thereby reduced: concentration on the period of rapid industrialization and urban growth would permit testing of the central hypothesis with only a short series of records.

But suitable data still had to be found, and the city to be studied selected. Of the many possibilities considered, three deserve comment. Trade directories were rejected as the major data source because they offered too limited a range of information - rarely more than a record of occupation and, perhaps, social status. In this respect rate books proved better, though they offered no means of assessing contemporary household and population structures. The main problem with rate books, at least in those towns examined, was their inconsistency. Information recorded in one year was often absent the next, making the amount of comparable data far

smaller than initially seemed likely. For this reason, rate books were rejected. The final source seemed more promising. Enumerators' Returns for the censuses 1841 to 1871 were available[1] for public inspection and research. Information was varied, ranging from occupation and birthplace to household and population structure by age, sex and relationship to the household head. Apart from differences in 1841, all the data followed a standard pattern and it was decided to adopt the Enumerators' Returns as the basic source.

Many additional advantages stem from this decision. The census is a national source: whereas use of rate books would have restricted analysis to one of the towns where such records were kept and have survived, adoption of the census made it possible to study almost any town or city in England and Wales. Further, the census is a uniform source, so that methods developed in one study may be repeated elsewhere. By contrast, trade directories and rate books are subject to local variations so that an approach used in one city may not be generally applicable. Finally, the census is a contemporaneous national source, so that different towns and cities may be compared at the same date. This is far less easy with other sources.

There are, however, disadvantages of the Enumerators' Returns which should not be overlooked. First, the census is decennial giving a large interval between data points. Second, Returns are available only for the period 1841 to 1871. Before 1841 enumeration was differently organized and no individual returns were collected. The confidentiality rule prohibits access to Returns for 1881 or later until they are over 100 years old. The period of analysis is therefore very brief given the large interval between censuses. Third, though the census contains a variety of important types

---

[1] At the Public Record Office.

of information, many subjects are not covered. There are no details regarding housing fabric, amenities, tenure, rents, income, education, recent migration experience etc. The census seemed the best source available and appeared to suit the purpose at hand, but it was not accepted uncritically. The present work attempts to assess the values and limitations of the data available from Census Returns in the light of the difficulties experienced in the empirical analysis.

Once the data source had been selected it was necessary to choose a town or city for detailed examination. Several requirements conditioned this choice. The town to be studied had to undergo rapid industrialization and urban growth during the period covered by the Returns. It had to be sufficiently large, even at the beginning of this period, to exhibit urban characteristics, yet not so large that a single researcher would be unable to accomplish analysis of all four censuses. (Use of 1841 Returns was ultimately abandoned for reasons described later.) Rough calculation suggested an 1871 population of 100,000 as the largest that could be handled at a sampling fraction large enough to present the requisite detail for small areas[1]. A short list of a dozen towns was drawn up, and of these Wolverhampton was selected[2]. Very rapid population growth occurred between 1841 and 1871, and the population size made the town manageable. The town was also of sufficient importance during the study period to attract several investigations by Royal Commissions, Committees, and Inspectors. For all these reasons Wolverhampton seemed a suitable test bed for hypotheses about temporal change during urban growth and industrialization.

---

[1] The cost of microfilm for larger towns became prohibitive.

[2] The proximity of Wolverhampton to Birmingham University was an additional consideration.

.6 Summary

The work which follows is divided into three parts, concerned respectively with elaboration of the theory, its operational interpretation, and the conclusions of this analysis. In Part One, detailed hypotheses are developed and the suitability of Wolverhampton 1841-1871 as a test bed is considered. Part Two tackles variable selection and concludes with a description of the analytical procedures used. The section attempts to assess the extent to which those census measures adopted reflect the theoretical constructs demanded for hypothesis testing. This is vital, for nineteenth century urban conditions - and data - differ considerably from those in the modern American cities where many of the techniques were first developed. Finally, Part Three presents the empirical findings with respect to the hypotheses and traces further lines for research and theoretical development. Each section may now be summarized in more detail.

Part One contains three chapters. Chapter 1 follows the gradual progress of thought regarding urban residential patterns and attempts to show that a form-function-process approach is slowly emerging. It is suggested, however, that a process-function view of the urban residential system is a pre-requisite of the fuller form-function-process approach. Above all, it is argued, there is a need for empirical evidence of temporal evolution in the functional lines of residential differentiation within a single city. Chapter 2 develops such a process-function view, offering both a stage model of urban residential patterns and predictions regarding the changes to be expected in an industrializing town. Chapter 3 describes Wolverhampton prior to 1851, both as background to the analysis which follows and as an indication of the suitability of the study period for examining the processes of industrialization and residential change.

Part Two embraces Chapters 4 to 7. Chapters 4 to 6 are devoted to reflection, in turn, of each of the major dimensions of social and

residential differentiation. For the purpose at hand it is crucial that the variables chosen adequately reflect the theoretical dimensions. The city, and not the census, is the subject of this study so it is imperative that census measures mirror contemporary urban residential patterns. The first three Chapters of Part Two therefore examine social conditions in mid-nineteenth century Wolverhampton in so far as they affect the selection of measures for each major social dimension in turn. Chapter 7 examines the methods of data handling and analysis used to test the hypotheses already outlined.

Part Three presents the results and conclusions of the analysis. Chapter 8 outlines the strong evidence for the temporal evolution of the dimensions of residential differentiation in Wolverhampton, and Chapter 9 considers the generality of this conclusion for different sets of areal units, different analytical procedures, etc. Chapter 10 introduces 'form' - the one element absent in the process-function approach so far adopted - and describes the spatial pattern of residential differentiation in Wolverhampton. This is seen as stemming from the operation of competition between the social groups for differentiated residential environments. The major differentiating factors are listed and an attempt is made to assess the quality of the residential environment which they imply. The relationship between environmental differentiation and spatial form is, it is argued, an area of potential advance in the study of residential patterns. Chapter 11 draws together the conclusions of this work and presents ideas for future consideration. Finally, Appendices furnish further detail on technical matters.

PART ONE

THEORETICAL DEVELOPMENT

"Individual cities ..... can be treated as particular accommodations to a many-sided societal process: urbanization." (Lampard, 1963, 233)

CHAPTER 1 MAJOR STEPS TOWARDS A FORM-FUNCTION-PROCESS VIEW OF URBAN RESIDENTIAL PATTERNS

A review of the literature concerning urban residential differentiation may appear *prima facie* as a gradual retreat from the type of generalized conceptual framework advocated above: the theoretical writings of Park are followed by the *ex post facto* rationalizations of Shevky and Bell, and in turn by data dependant empiricism in early factorial ecology. It is more useful, however, to regard the historical development of the literature, not as a tale of retrogressive woe, but as one of uncomfortable lurches towards a form-function-process approach. Three major "lurches" are identified in sections 1.1 to 1.3, with the steadier progress of more recent work forming section 1.4.

1.1 Human Ecology And Views Of Urban Structure

1.11 Park on Process

Much of the conceptual framework of modern urban sociology may be traced back to the pioneering work of the "classical human ecologists" (Timms, 1971, 5). The work of Park was crucial. Before Park, a theory of urban structure was conceivable - but only just. Park offered perhaps the first rationale which went any way towards organizing the mass of observations about the city into predictable categories. Yet detailed examination of his writings reveals that, despite the importance of theory, many of Park's ideas depend on the empiricist's detailed first-hand knowledge of his subject (the city of Chicago). Even Park's enthusiasm for the biological analogy, which provided the general framework of his study, derived from the contemporary appeal of "Social Darwinism" (Herbert, 1972, 58). Central to Park's ecological theory was Darwin's concept of the *web of life* - the intimate inter-relationship between organisms, and between organisms and their environment (see Park, 1952 reprint, 145). Park believed that, as an animal, man was subject to biological laws related to the need for

survival. But because man was also subject to social impulses he based the conceptual framework of human ecology on a simple dichotomy between two distinct levels of human activity. Society was an aspect of man's increasing sophistication - a superstructure above the more basic competitive level of community. Human ecology studied the community produced by inevitable natural forces; society was part of the concern of social psychology.

According to Park the biotic level of human activity gave rise to the community and was based on the sub-social forces of competition. He described three essential characteristics of a community as (a) a territorially organized population that is (b) fairly rooted in the soil it occupies with (c) its individuals living in mutual interdependence that is symbiotic rather than societal. The symbiotic interdependence of individual organisms in fact formed a superorganism (Park, 1952, 148). So at the biotic level Park saw people as individual organisms without social attributes and subject to the same impulses and forces as plants or animals in their struggle for survival and for the most favourable circumstances in which to live. "Within the limits of the system the individuals in the population are involved in competitive cooperation which gives to their interrelations the character of a natural economy." (ibid., 147). At the biotic level Park translated the processes of plant ecology into human terms.

The key concept was that of competition, described by Robson (1969, 10) in the following terms.

> "Man competed for limited space and for access to the most desirable locations for his residence and for his business activities. Such competitive activity was reflected in land values which, through the price mechanism, sorted out like types of person into similar sorts of areas. It was this process which accounted for the segregation of the Central Business District, the areas of commerce, and the residential areas of similar sorts of people. Different types of people were segregated in terms of their ability to pay the various rental levels. The slum area represented an area of minimum choice and so collected a population which was homogeneous in terms of its economic competency, even though in ethnic terms it may be very

heterogeneous. Competition thus led to segregation of like types of persons and like types of business and commercial activity."

Related to this was the concept of dominance, used in plant ecology to describe the way in which one species of superior competitive ability might control the environmental conditions encouraging or discouraging other species. (Robson, 1969, 11 describes a beech climax in which the tree's height and foliage restrict the light at lower levels, so controlling the type of plants which can grow there.) In the city the C.B.D. is dominant: businesses compete for locations with maximum accessibility, so land values are higher at the city centre, and this influences the location of other elements. But dominance also refers to the role of particular activities in particular areas. 'Nob Hill' is dominated by the wealthy: lower income groups cannot afford the rents; Chinatown, by the Chinese: new arrivals prefer to live with relatives and compatriots while those of other races prefer to live elsewhere. Competition and dominance thus lead to segregation, producing internally homogeneous natural areas. Closely related to dominance was the concept of gradient for just as in complex organisms, such as the brain, concentration of control increased with the developing differentiation of major organs, so - in the city - there was a gradient of land values, declining outward from a peak at the functional centre.

The ecological processes of invasion and succession were adopted as mechanisms explaining the rapid change seem in many Chicago neighbourhoods in the early twentieth century. The analogy is with seral development in plant ecology in which the most tolerant species colonize extremes. In so doing, they modify soil, microclimatic and other conditions creating an environment in which slightly less tolerant species can live. These 'invade', slowly establish their own dominance and, as amelioration of the environment continues, form part of a succession of dominant elements. Human analogies included businesses invading residential areas, and lower income groups invading high status neighbourhoods. In Chicago, invasion

and succession were most obvious when members of one ethnic (rather than income) group replaced those of a different group in a particular area.

Above this biotic level was the cultural level giving rise to society and based on communication and consensus; the operation of these cultural processes distinguished man from other organisms. Park defined society from the ecological viewpoint, and in so far as it was a territorial unit, as "just the area within which biotic competition has declined and the struggle for existence has assumed higher, more sublimated forms" (Park, reprint 1952, 150-1). He admitted, however, that human inter-relations were far more complex than this simple dichotomy suggests - exhibiting an economic, political and moral as well as an ecological order. To Park, human ecology was concerned with a social order based on competition rather than consensus, and was therefore identical with plant and animal ecology.

The writings of Park and his followers provoked much criticism. The concept of gradient was incompatible with that of 'natural area', biotic and cultural levels were indivisable in human society and community and society could only be arbitrarily separated (Alihan, 1938, 81-91). The criticisms were numerous, and it is not intended to summarize them all here, but some comment must be made concerning the limitations of Park's viewpoint - particularly when it is seen in the light of the call by Eichenbaum and Gale (op. cit.) for a methodology embracing form, function and process.

Park and the human ecologists are frequently criticized for confining their studies to one unique situation (see, for example, Gettys, 1940). Park was working in Chicago, and during the early twentieth century Chicago was a city of change which had experienced a prolonged period of foreign immigration from different sources. It is perhaps understandable, therefore, that Park's ideas should embrace change so completely. The processes of invasion and succession were particularly suited to describe the type of changes operative in contemporary Chicago, while competition has very clear

dynamic implications. Process was consequently given a central place in his theoretical scheme. It must be admitted, however, that Park's conception of process was incomplete; the normal situation was regarded as being one of continued immigration to perpetuate the processes of invasion and succession. There was no recognition of the possibility that international immigration might eventually dwindle. Park's limited view of process was clearly conditioned by contemporary conditions.

Other limitations of Park's work are even more serious. Despite his recognition of the land value 'price' mechanism as a clear expression of competition, and in spite of his writing about the ghetto, Little Sicily and other ethnic areas, Park presents no clear rationale for expecting a particular set of functional areas rather than any other. Instead he writes about the Chicago of the 1920s where residential segregation by race and by income were empirical facts which required no justification. As a result Park does not specify the spatial implications of the processes which he has identified in any clear and generalized way; he tends rather to write about specific subareas of the one city that he knew so well. In one sense he was writing about real places and so his work is more meaningful than some of the vague spatial abstractions which were to follow. Yet his treatments of spatial form and of functional differentiation were rather different from his insights regarding process. Whereas his identification of invasion and succession pointed to general processes operating in many cities, his views of form and of function were more nearly tied to Chicago. True we have a dominant C.B.D. in the city centre, and other natural areas where other uses predominate but the exact functional and spatial relationships between these different areas is uncertain except in so far as they exist in Chicago in the 1920s.

Briefly, therefore, it is necessary to make many assumptions about the composition of society, and the lines upon which it is divided before

there is sufficient reason for suggesting invasion and succession between different income and/or ethnic groups. Many assumptions must also be made regarding the relative attractiveness of sections of the housing stock throughout the city to the groups with widest choice before the spatial form of residential differentiation can be predicted. Even more assumptions must preface exploration of non-residential patterns. Because he was working in 1920s Chicago Park accepted growth by immigration of diverse origins as the norm and so identified an important set of processes operating in such conditions. With respect to the spatial and functional bases of differentiation his work was less clear.

1.12 Burgess on Process and Form

In 1923 McKenzie divided Columbus, Ohio into concentric rings expressing the form of its growth. Burgess applied this to Chicago in a concentric zone model which Robson (1969, 13) considers "the logical spatial expression of the ecological principles of central dominance, segregation, invasion and succession. Development outwards was accompanied by the differentiation of the successive rings of new growth and the invasion by different elements of the older inner rings of the city". Robson exaggerates the extent to which Burgess logically applied ecological principles to derive spatial form; Burgess was less interested in the city than in the way it influenced human behaviour. The very title of the paper in which he first proposed the model, "The Growth of the City: an introduction to a research project" (Burgess, 1925, 47-62) suggests the extent of his interest in the city per se. His central concern is clear in the following extracts from that paper.

> Segregation "offers the group, and thereby the individuals who compose it, a place and a role in the total organization of city life. Segregation limits development in certain directions, but releases it in others. These areas tend to accentuate certain traits, to attract and develop their kind of individual, and so to become more differentiated." Rapid urban expansion "is accompanied by excessive increases in disease, crime, disorder, vice, insanity and suicide, rough indexes of social disorganization". "Empirically ..... areas of mobility are also regions of juvenile delinquency, boys' gangs, crime, poverty, wife desertion, divorce, abandoned infants, vice." (ibid., passim).

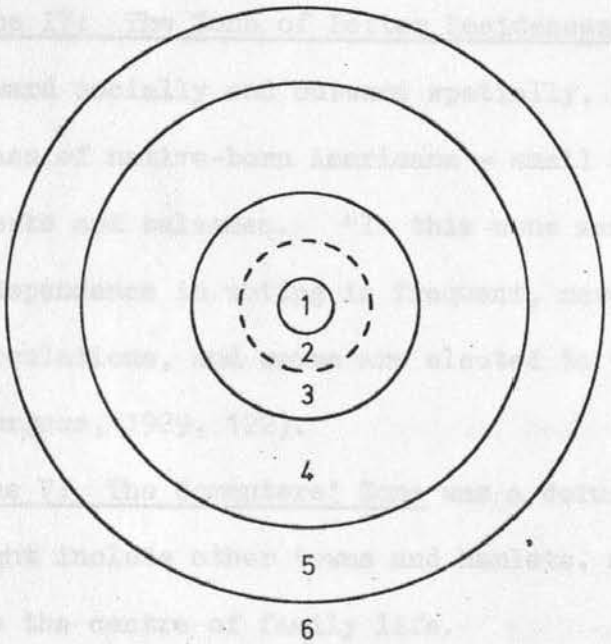
The empirical rather than theoretical origin of Burgess's ideas is clear. Later, he wrote "We were very impressed with the great differences between the various neighbourhoods of the city, and one of our earliest goals was to try and find a pattern to this patchwork of differences, and to 'make sense of it'" (Burgess and Bogue, 1963, 6). Like Park, therefore, Burgess was an empiricist, his work inductively based (Johnston, 1971, 66).

The five zones of Burgess's model (Fig. 1.1) may briefly be described as follows.

(a) Zone I: The Central Business District focussed on the city centre retailing core with department stores, shops, offices, banks, theatres, hotels, museums and headquarters of economic, social, civic and political life. Around this core was the Wholesale Business District of markets, warehouses and storage.

(b) Zone II: The Zone in Transition was an area of jumbled land uses: commerce and business intermixed with ageing, high density subdivided housing occupied by the poor and undesirable. Since the area was on the edge of open land when the wealthy first began to move out of the city centre, houses were large, but encroachment of C.B.D. business and industrial uses had reduced residential attractiveness, making repair and maintenance unprofitable (Lowry, 1960) and encouraging subdivision. According to Burgess the zone in transition comprised an inner belt of factories, and an outer area of declining neighbourhoods, first generation immigrant colonies, bedsitter districts and resorts of gambling, sexual vice and crime. Incoming ethnic groups found there cheap accommodation and a lack of strict enforcement of social controls. As people prospered they escaped outward, leaving behind a residue of the helpless.

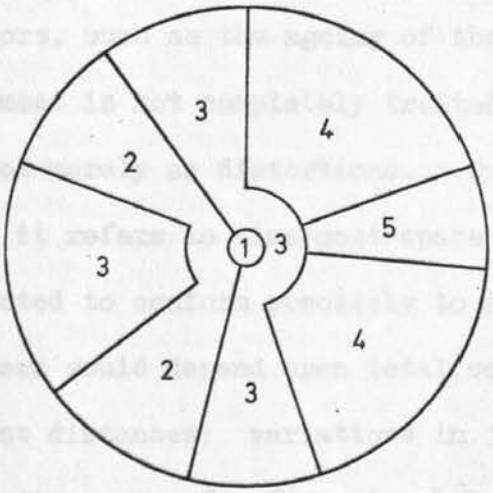
(c) Zone III: The Zone of Independent Workingmen's Homes was largely one of second generation settlement. As immigrants became more Americanized and more affluent they moved outwards from Zone II. "The move itself



Key

1 C.B.D.
2 Factory Zone
3 Zone in Transition
4 Zone of Workingmen's Homes
5 Residential Zone
6 Commuters Zone

Figure 1·1: Burgess's Zonal Model



Key

1 C.B.D.
2 Wholesale and Manufacturing
3 Low Status Residential
4 Middle Status Residential
5 High Status Residential

Figure 1·2: Hoyt's Sectoral Model

was a process by which their assimilation was confirmed and consolidated" (Robson, 1969, 13). The residents of the area wish to live near, but not too near to their work: father worked in the factory while his children typically had jobs in Zone I, and planned - upon marriage - to set up homes in Zone IV.

(d) Zone IV: The Zone of Better Residences therefore marked the next step upward socially and outward spatially, housing the white-collar middle-class of native-born Americans - small businessmen, professional people, clerks and salesmen. "In this zone men are outnumbered by women, independence in voting is frequent, newspapers and books have wide circulations, and women are elected to the state legislature" (Burgess, 1929, 122).

(e) Zone V: The Commuters' Zone was a dormitory suburban belt, which might include other towns and hamlets, and where the wife and mother was the centre of family life.

Again criticism is considered only in so far as it is relevant to the desire for a form-function-process view of urban structure. It has already been suggested that Burgess was less interested in the form of urban structure than in change, and its effects on social disorganization. His treatment of form is therefore far from ideal. Certain physical environmental factors, such as the ageing of the fabric, are taken into account, but environment is not completely treated, with even such factors as relief listed merely as distortions. Quinn's defence of the model (1940) admits that it refers to time/cost space rather than real space: the city is not expected to conform precisely to a concentric circular pattern. Such a pattern would depend upon total correspondence between straight line and time/cost distances; variations in journey time might mean that, on the ground, zones were far from circular. Despite the clear references to spatial differences in the residential fabric, particularly with respect to age, it is difficult to apply the zonal model to detailed variations

in housing quality. If the model is applicable to questions of form, it is only at the most generalized level.

Function is even less adequately treated. The particular complement of zones recognized owes more to arbitrary observation than to rigorous theory. From Burgess's own description the C.B.D. might be split into separate retailing and wholesaling areas, and the Zone in Transition into an industrial belt, and a surrounding slum housing district. There is no clear justification for recognizing two rather than four zones. In residential areas confusion is worse with a mixture of all the differentiating dimensions normally held to be independent (though a partial explanation of this emerges in Section 2). The empirical validity of the work is also questioned. Burgess seems to imply a zonal arrangement of status such as is confirmed by Haggerty (1971) when isolating temporal change, yet Guest (1971) shows the outward increase in social status disappears if patterns are controlled for negro distrubutions. It is uncertain precisely what Burgess meant, as Johnston (1971, 67) explains.

> "Most subsequent workers have interpreted these five zones as indicating a continual increase of socio-economic status away from the city centre. This is almost certainly true for the first four zones, accepting Burgess's assumption that immigrant groups rate lowly on socio-economic status, but the meaning of the fifth zone is not clear. Its name suggests a broad spectrum of the population who can afford to be commuters, and it is perhaps for this reason that researchers, such as Abu-Lughod (1969), have associated the zonal model with family status rather than social rank. Nevertheless, in the 1920s commuting over any great distance would have been confined to a much smaller proportion of Chicago's society than now, and in another paper Burgess (1927, 178) suggested that beyond the zone of workingmen's homes 'the professional and clerical groups employed in the downtown offices live still farther out, while those who can afford it and who prize suburban life escape to the commuters' zone'. This suggests a zonal correlation of wealth with space preferences, but Zone V was also described as the domain of the matricentric family, which has few socio-economic connotations. Similarly, Zone III residents were those who desire to live near but not too close to their work, who could be of any status level."

As criticism of Burgess this is unfair - expecting of him, in retrospect, ideas which were developed later. But no criticism is intended; rather it is desired to define the extent of Burgess's contribution, the better to appreciate the significance of later work.

Burgess's main concern was with process: he argued from the dynamic aspects of urban growth towards some statement of the form which might result - "the typical process of the expansion of the city can best be illustrated ..... by a series of concentric circles ...." (Burgess, 1925, 48). But his ideas, like those of Park, referred narrowly to the period in which he was working, and in this sense his description of the processes of change, and their spatial consequences, was incomplete. He presents a system which never reaches equilibrium (Duncan et al., 1961-2), but which is continually growing by radial expansion from the C.B.D. Chicago in the 1920s had witnessed sixty years of rapid expansion due to foreign immigration, and the model assumes a population differentiated in terms of migration experience and ethnic background as well as occupation. It is based on impersonal competition, assuming private property ownership in the absence of city planning. "Power is equated with wealth. The rich locate where they will, the poor where they have to ..... The institutions of city planning processes and the direct intervention of government into the housing market may well halt and even reverse the processes which provide the dynamics of the model" (Timms, 1971, 216-7; see also Schnore, 1965, 347-98). Despite this temporally narrow conception of process, Burgess's ideas may be labelled 'process-form'; only functional aspects were neglected completely.

1.13 Hoyt's Directional Component of Form

Burgess's model received both theoretical and empirical criticism, but significantly it was the latter which provided the second classical urban structure model. Though ecologists expressed doubts about Burgess's work it was the land economist Homer Hoyt who presented a reasoned alternative backed by substantial evidence. Like Burgess, Hoyt developed his model inductively, though not on the basis of a single city (Johnston, 1971, 79) and it may be defended in purely theoretical terms.

In 1939 Hoyt produced the Federal Housing Administration report The Structure and Growth of Residential Neighbourhoods in American Cities.

With rental data for numerous cities he traced the movement of high status residential areas which, Hoyt claimed, determined the locations of many other urban uses. The key high status residential areas tended to move outward down radial routes from the town centre in distinct sectors, pulling the growth of the whole urban area in the same direction. The main dynamic element is provided by the filtering mechanism: as the elite move outwards to newer high rent areas so middle status groups filter into the former high rent areas that they have abandoned; the former middle-rent zone thus vacated is occupied by lower status groups. Once established in a particular sector of the city, high status areas tend to grow outward within that sector; likewise low status areas retained their character for long distances outward. The origin of the high status sector was determined by the location of the retail and office centre where the higher income groups tended to work and which was probably furthest from industrial parts of the city.

> "In each city the direction and pattern of further growth tends to be governed by some combination of the following considerations: (a) High-grade residential growth tends to proceed from the given point of origin, along established lines of travel or towards another existing nucleus of buildings ..... (b) The zone of high rent areas tends to progress toward high ground which is free from the risk of floods and to spread along lake, bay, river and ocean-fronts ..... not used for industry ..... (c) High-rent residential districts tend to grow toward ..... free, open country ..... and away from 'dead end' sections which are limited by natural or artificial barriers to expansion ..... (d) The higher-priced residential neighbourhood tends to grow toward the homes of the leaders of the community .....(e) Trends of movement of office buildings, banks and stores, pull the higher-priced residential neighbourhood in the same general direction ..... (f) High grade residential areas tend to develop along the fastest existing transportation lines ..... (g) The growth of high-rent neighbourhoods continues in the same direction for a long period ..... (h) De-luxe high-rent apartment areas tend to be established near the business centre in old residential areas ..... (i) Real estate promoters may bend the direction of high-grade residential growth ....." (Hoyt, 1939, 117-9).

Figure 1.2 shows the type of sector pattern Hoyt proposed. Five generalizations are normally quoted (Johnston, 1971, 81; Timms, 1971, 225; etc.; see Hoyt, 1939, 75-6) to summarize his view of urban structure:

(a) The highest rental area is in every case located in one or more sectors on the side of the city.

(b) High-rent areas take the form of wedges extending in certain sectors along radial lines from the centre to the periphery.

(c) Intermediate rental areas ..... tend to surround the highest rental areas or to adjoin such areas on one side.

(d) Intermediate rental areas on the periphery of other sectors ..... besides the ones on which the highest rentals are located are found in certain cities.

(e) Low rent areas extending from the centre to the edge of settlement on one side or in certain sectors of the city are found in practically every city. There may be a low rent ridge through the centre of the city or from the centre to the periphery on one side or sector. Or a low rent area near the centre of the city with an intervening high rent area may be matched by an area with equally low rent on the periphery of the same sector. One or more sections of a city thus acquire a low rent character, and in these sectors there is no tendency toward an upward gradation of rents from the centre to the periphery.

It remains to evaluate Hoyt's work against the holistic form-function-process view advocated earlier. Like Burgess, Hoyt was more interested in process than in form: "the spatial expression of Hoyt's theory is presented almost as an aside. The main raison d'etre of the thesis is exposition of a theory of changes in the patterning of rental areas over time" (Timms, 1971, 224). Though his treatment of form was therefore crude, Hoyt added a definite directional component to Burgess's rudimentary notions. He suggested that invasion and succession differed from sector to sector - the rooming house district being typically at the central apex of the high status sector where big, old houses provided conditions ripe for subdivision. Hoyt's model has been seen as "a practical, rather than ..... a theoretical instrument"

(Timms, 1971, 225). Hoyt, it is argued, did not offer an ideal-type construction but an empirical generalization useful for making practical financial decisions about future developments. In these respects Timms contrasts the model with that of Burgess. Yet, accepting that Hoyt added a directional component to an essentially centrifugal model, it is possible to argue that the sectoral view is at least as theoretically sound as the (empirically based) notions of Burgess. As far as form is concerned, Hoyt incorporated many factors treated as distortions by Burgess's model. Both assumed central dominance, segregation, outward growth, invasion and succession, but whereas Burgess saw variations in transport facilities, relief and heavy industry as distortions, Hoyt recognized the role of such environmental factors in shaping form. The better-off preferred to live in well-drained areas away from heavy industry and on rapid transport routes, and their higher incomes provided a pre-emptive ability in residential location. Those of moderate means made their selection next, choosing to live as near to the various advantages as possible - hence they often occupied sectors surrounding the high status area. In terms of form, therefore, Hoyt improved on the view offered by Burgess: urban residential space is not undifferentiated in terms of attractiveness, and Hoyt recognized this.

With regard to function there is room for debate. It might be claimed that, like Burgess, Hoyt had no clear conceptualization of the dimensions of differentiation amongst residential subareas and that the same criticisms apply to both models. But, Hoyt's concentration upon property values might be held to refer solely to a socio-economic axis with a sectoral distribution (see section 1.42). Whatever the merits of this latter view, it is clear that Hoyt offers no complete theoretical understanding of the functional aspects of differentiation; if he exposed the sectoral disposition of socio-economic status the reason lay more in his choice of data than in the depth of his insight. Function, it may be concluded, is inadequately treated.

As far as process is concerned, the criticisms of Burgess apply equally to Hoyt. The underlying dynamic mechanisms specified by Hoyt are surprisingly similar to those of Burgess: change of occupance was still essentially centrifugal as the city expanded. Again, many assumptions relate to the period during which the work was done producing an incomplete conceptualization of process. Timms (1971, 226) puts the matter clearly.

> "The theory envisaged a growing population, a wide range of commercial and industrial undertakings in the city, a single dominant nucleus, and, ... a laissez-faire, private enterprise economy, in which impersonal competition can have full play ..... The original exposition ..... coincided with the first burgeonings of the automobile age. Although it took into account the effects of road transport on the siting of industry, it paid little attention to its potential effects on residential location. As presented the theory was ..... based on the evidence of the past and thus related to conditions which have since been radically altered."

Hoyt (1964, 209) later conceded the point. "The automobile and the resultant belt of highways encircling American cities have opened up large regions beyond existing settled areas, and future high-grade residential growth will probably not be confined entirely to rigidly defined sectors." Despite his narrow view of process, however, Hoyt may be said to have produced a process-form treatment of urban residential patterns which, as far as form is concerned, represents an advance on the ideas of Burgess.

1.14 Harris and Ullman's "Model"

Both Burgess and Hoyt simplified and generalized. Harris and Ullman (1945) protested that the spatial pattern was more complex, and rejected the implicit assumption of the two earlier models that urban land use is arranged around a single centre.

> "In broad theoretical terms such an assumption may be valid, inasmuch as the handicap of distance alone would favour as much concentration as possible in a small central core. Because of the actual physical impossibility of such concentration and the existence of separating factors, however, separate nuclei arise." (ibid., 17).

They suggested four factors which, together, lead to the development of distinct space-organizing nuclei in a city:

(a) Some activities need special facilities - e.g. retailing needs accessibility.

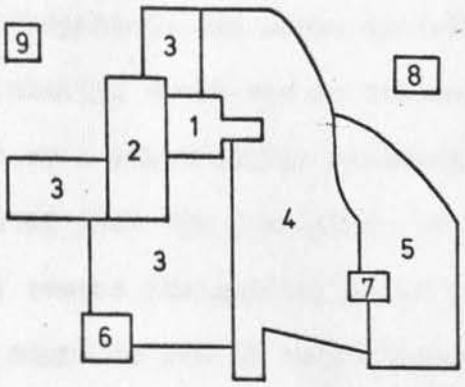
(b) Like activities cluster for external scale economies as in office areas and industrial belts.

(c) Some activities are detrimental to others - e.g. noxious industry to high class housing.

(d) Activities unable to afford high rents form subsidiary clusters - e.g. in the C.B.D. space hungry furniture stores and car showrooms are usually peripheral.

Figure 1.3 shows the model proposed. Johnston (1971, 95-6) sees their contribution as emphasizing the role of unique factors in each city; effectively, however, Harris and Ullman deny that any generalized theory can predict the complex patterning of a city. Timms (1971, 211) declines to discuss the model clearly considering that, unlike the two earlier works, it is not concerned with the structural connotations of particular differentiating processes, does not predict particular patterns of residential differentiation, and is not readily tested empirically.

Form is only cursorily handled: some activities cluster, other repel. Though different functional areas are recognized, no coherent view of the functional bases of differentiation is offered. Harris and Ullman merely list four processes, relevant only within a limited time scale, and stress the unpredictability of the resultant segregated pattern. By proclaiming the dominance of unique factors in explaining urban diversity, their thesis runs counter to the philosophy of the present study (section 0.1). If the structure of urban residential neighbourhoods is unpredictable, the task of describing regularities is futile and research will revert to squirrel-like hoarding of local oddities instead of bringing a clearer understanding of the city.



Key

1 CBD
2 Wholesale and Manufacturing
3 Low Status Residential
4 Middle Status Residential
5 High Status Residential
6 Heavy Manufacturing
7 Outlying Business District
8 Dormitory Suburb
9 Industrial Suburb

Figure 1·3: Harris and Ullman's "Model"

Family status	Low			High
High	1A	2A	3A	4A
	1B	2B	3B	4B
	1C	2C	3C	4C
Low	1D	2D	3D	4D

Social rank

Figure 1·4: Social Area Diagram

1.2 Social Area Analysis

Urban structure models and the underlying ecological ideas described the processes operating in some American cities at a particular time in history, and suggested the type of spatial pattern (or form) which might result. There was no explicit justification of the various units which were recognized, and whose distribution was being described. More particularly, there was no statement of the ways in which the residents of one area might differ systematically from those of another. Burgess suggested that the population of the Zone in Transition might be largely one of recent immigrants, while that of the Zone of Independent Workingmen's Homes might be one of second generation immigrants, and the outer zones were occupied by increasingly wealthy native Americans or those who chose to live in rural surroundings. Though he identified ethnic differences and migration experience, and also implies life style orientations, it is probable that he regarded wealth as the determining factor. Hoyt too, perhaps because of his concern with housing quality, seems to have regarded income level as the major discriminant. Ideas regarding the "functional" aspects of residential differentiation were, therefore, poorly developed.

In this sense, Social Area Analysis (marking the beginnings of a search for the dimensions of urban social differentiation) represents a second "lurch" forward in the study of urban residential patterns. Though it did not answer all of the needs, Social Area Analysis pointed the way for future research - suggesting that the wide variation in neighbourhood characteristics could be accounted for by a much smaller number of underlying constructs. As such it not only represented a major advance in thinking with regard to function, but - by stressing the central importance of social change - also provided the basis for considerable development of ideas regarding process. Here, though only in embryo, was the basis for a description of process without the cultural and temporal assumptions of

Park, Burgess, Hoyt and others. Again the work was (probably) essentially inductively based, though the authors apparently try to conceal this with an ex post facto rationalization (Hawley and Duncan, 1957). Whatever its origins, the work provided a stimulus for criticism, debate and research.

The methods and theory of Social Area Analysis are presented in a series of papers between 1949 and 1968. From the start (Shevky and Williams, 1949) method and theory have been passionately attacked and defended. Timms (1971, 124) sees Social Area Analysis as an evolving model shaped by contemporary theories of social change and development. Initially (Shevky and Williams, 1949) Social Area Analysis seemed to be an ad hoc descriptive technique: an 18-celled typology was used to classify census tracts with similar scores on the three scales social rank, urbanization and segregation. Erikson (1949) pointed out that the significance of the three scales was not explained, and the reason for selecting them and their frame of reference remained vague. Not until six years later (Shevky and Bell, 1955) was the theoretical rationale presented. The long delay has given rise to the suspicion that the theoretical model developed by Shevky and Bell is an ex post facto rationalization of the earlier choice of indicants. Even so, the work was a significant step forward.

Shevky and Bell see the modern city as a product of the complex whole of modern society; "thus the social forms of urban life are to be understood within the context of the changing character of the larger containing society" (ibid., 3). 'Changing character' refers to the process of urbanization in society. The central concept of increasing scale embraces such changes in the total society. The concept of scale was borrowed from Wilson and Wilson (1945, 25) who used it to mean "the number of people in relation and the intensity of these relations". In developing from primitive to modern, a society was transformed by the number and range of interdependancy relationships: in primitive societies each village may be almost

independent, producing most of its own needs and trading only locally, whereas world-wide trade is important in the normal life style of urbanized populations. As societies change from small to large scale, Shevky and Bell argue, there are many concomitant changes in the pattern of functional differentiation.

> "If we conceive of scale as the scope of social interaction and dependency, the past century has witnessed a vast increase in the scale of American society. Not only has the total national population become more interdependent, with a resulting increase in the scope of interaction - but American society has relations with most of the people of this earth. At the same time, the intensity of dependence on, and interaction with the immediate social environment has tended to diminish: 'national consciousness' ..... becomes more important, 'neighbourhood consciousness' less so" (Shevky and Bell, 1955, 7).

The results of increasing scale are identified with Wirth's propositions regarding the characteristics of modern, as opposed to primitive traditional, societies. But, unlike Wirth, Shevky and Bell believe that "it is not the city which is an underlying 'prime mover' in the recent transformation of Western society, but the necessities of economic expansion. Size, density and heterogeneity, important in describing the urban gambit, are not the most significant structural aspects of urbanization - for urbanization is a state of a total society, as well as of its cities" (ibid., 8).

Shevky and Bell argued that technological changes permitted increased productivity in modern societies, allowing more complex economic organization. Improved agricultural productivity, for example, raises the number of people that can be employed in non-agricultural occupations such as manufacturing and services. As manufacturing productivity rises, due to technological innovation, specialization leads one town to produce far more needles than it can possibly sell locally, while other towns specialize in other products. Trade over an increasing area is essential, and this increases employment in transport and commerce. Raw materials are also drawn from an increasingly wider area and so interdependency grows. This economically deterministic view stems from Clark's analysis of occupation

structures in countries at varying stages of economic development. The process of development was found to correspond with a movement of working populations from agriculture to manufacture, and thence to tertiary service occupations including commerce and communications. Timms (1971, 127) summarizes the position as follows: "The resulting increase in scale is evidenced in a variety of trends. Changes occur in the nature of income-producing property, in the growth-curves of the population and in its age and sex characteristics, in the nature of economic enterprise and in the characteristics of the professions. Increases are recorded in the proportion of the population living in cities, in the number of salaried and wage-earning employees ..... and ..... in the proportion of the workforce employed in managerial and supervisory positions within newly-emergent organs concerned with co-ordination, control and direction." Each of these trends is held to reflect one or other of three basic dimensions of social change: changes in the distribution of skills, changes in the nature of productive activity and in the composition and distribution of the population. These trends are structural reflections of increasing societal scale and may serve also as analytical concepts for the description of modern social structure: different subpopulations stand in differential relationship to these three major trends and can therefore be characterized by their positions on the three dimensions of change. Udry (1964) and Anderson and Bean (1961) are reluctant to admit that a theory of societal change can be translated into a typology in this way. It is also difficult to see how three closely related aspects of increasing societal scale become three <u>independent</u> areas of social differentiation.

Table 1.1 illustrates the argument presented by Shevky and Bell (1955, 4) regarding the formation of the three social constructs. The <u>first</u> trend reflects changes in the bases of rank and reward occasioned by technological developments. As a society increases in scale "..... the occupations

Table 1.1 Formation of Social Area Constructs

Postulates concerning industrial society (aspects of increasing scale) (1)	Statistics of trends (2)	Changes in the structure of a given social system (3)	Constructs (4)	Sample statistics (related to the constructs) (5)	Derived measures (from col. 5) (6)	
Change in the range and intensity of relations	Changing distribution of skills: lessening importance of manula productive operations - growing importance of clerical, supervisory management occupations	Changes in the arrangement of occupations based on function	Social rank (economic status)	Years of schooling Employment status Class of worker Major occupation group Value of home Rent by dwelling unit Persons per room Plumbing and repair Heating and re-friger-ation	Occupation Schooling Rent	Index I
Differentiation of function	Changing structure of productive activity: lessening importance of primary production - growing importance of relations centred in cities-- lessening importance of the household as economic unit	Changes in the ways of living - movement of women into urban occupations - spread of alternative family patterns	Urbanization (family status)	Age and sex Owner or tenant House structure Persons in household	Fertility Women at work Single-family dwelling units	Index II
Complexity of organization	Changing composition of population: increasing movement - alterations in age, sex distribution, increasing diversity	Redistribution in space - changes in the proportion of supporting and dependent population - isolation and segregation of groups	Segregation (ethnic status)	Race and nativity Country of birth Citizenship	Racial and national groups in relative isolation	Index III

Source: Shevky and Bell, 1955, p.4.

within (that) society are regrouped: they become hierarchically organized into levels of skill, income and prestige. Modern society, in contradiction to traditional societies, is organized on an occupational basis. Only in the modern period has occupation come to have a determining influence upon status and rank" (Shevky and Bell, 1955, 9). These changes are reflected in the construct of social rank indexed by data on occupation, education, and rent.

The second trend was originally labelled urbanization, being intended to reflect the changing nature of production. Three effects of these changes are distinguished: (a) Population no longer expands to the limit of resources (as Malthus suggested) because contraception makes fertility a matter of individual choice; in this situation some people adopt a family-based life style while others pursue property or career. (b) The rise of large scale factory production reduces the importance of the family as a unit of production, allowing changes in kinship functions. (c) Co-ordinating and communicating activities become increasingly important, producing a new middle class who perform such functions. The net effect of all three trends is said to be a widespread variation in family types, with a new role for women freed from continual childbearing and able to support a non-familistic life-style while working in one of the expanding clerical or commercial occupations. Urbanization is indexed by fertility, women in the labour force, and single family dwelling units. As the least satisfactory part of the three construct model, it was the cause of disagreement between Shevky and Bell. Shevky stressed the wider aspects of the organizational structure of the economic system (implied by the title urbanization) while Bell preferred the label family status signifying a more direct measure of a value orientation favouring children rather than career or consumption (Bell, 1968, 132-68).

The third and final trend embraced in increasing scale concerns increased mobility. The concomitants of this greater mobility are said

to be (a) A redistribution of population in space. (b) Changes in age sex distributions affecting the relative size of supporting and dependent populations. (c) An increase in diversity producing isolated subgroups which are functionally significant for the total society. Yet the construct is labelled segregation and is indexed by isolated racial and national groups. No use is made of age structure, dependency rates or population densities despite their apparent relevance to the concomitants of mobility.

Considerable disagreement arose concerning the choice of indicants for each of the three constructs, the way they should be expressed and how they should be combined. To facilitate intercity and/or temporal comparison social rank and familism indicants were standardized to their ranges in the 1940 Los Angeles data; as exact comparability of indicants is rare, comparison of scores is often impossible despite the standardization. Given Shevky and Bell's statement regarding occupation, that "no other single characteristic tells us so much about the individual and his position in society" (Shevky and Bell, 1955, 9) it may seem strange that it should carry equal weight with the other two indicants on the social rank construct (Duncan, 1955, 84-5). But accepting this, it is even more difficult to understand how one of the indicants (rent) can be dropped in a later analysis (Shevky and Bell, 1955, 23-4) when the data were unavailable. It is not intended to present the detailed criticism of the Shevky-Bell technique which developed in the literature (see Timms, 1971, 133-210), but merely to note those limitations of Social Area Analysis that are relevant to our main purpose.

Figure 1.4 shows the typology proposed by Shevky and Bell, but refers to only two of their three axes; when high and low scores on ethnicity are recognized (a simple dichotomy) a total of 32 categories emerges. It should be noted that these 32 categories are described as 'Social Areas', and that although Shevky and Bell used the typology to classify census

tracts they regarded it as a subdivision of social (rather than of physical) space, and one which could be applied at any scale of analysis from city blocks to nations. There is therefore no recognition of scale problems and no suggestion that any particular scale of analysis is more suitable than any other in the study of urban residential differentiation. The existence of any difficulty is specifically denied (Shevky and Bell, 1955, 20).

There is also no provision for the possibility that dimensions other than the three specified might be relevant, either in particular cases or in general. Indeed, if the Social Area approach is followed closely it would be impossible to discover any alternative to the three constructs proposed. Even more serious is the fact that the technique described cannot, of itself, suggest any arrangement of the seven indicants on the three constructs other than the one prescribed. Adoption of the technique is consequently an act of blind faith on the part of the researcher, and as such can hardly form part of a hypothesis testing framework.

Finally it must be admitted that, although Social Area Analysis provides a useful approach towards the "functional" aspects of the urban residential system, the treatment of process is less than adequate. The concept of increasing societal scale is undeniably a dynamic one, yet it is not translated into an evolutionary model of urban residential differentiation. Instead, three aspects of increasing societal scale are taken as key characteristics of industrial urban society, and what might have been a description of social change becomes a polar type epitomizing the consequences of that change. Effectively then, Shevky and Bell present a before-and-after dichotomy and devote most attention to the later situation.

Treatment of spatial form was not intended, despite the use of census tract data. It is apparent, however, that the scores derived on each construct for each sub-area provide some basis for describing the pattern of residential differentiation. It must be admitted that Social Area Analysis

is too social and, as Michelson (1970, 14-5) argues, forgets the nature of the areas under consideration. Only one variable (single family dwelling units) relates to the man-made physical environment, providing strong grounds for a charge of incomplete conceptualization of the human environment. The technique treats areas as statistical units, not as separate districts with their own characteristic residential structures.

To summarize, Social Area Analysis offers the set of functional categories lacking in urban structure models, but the reasoning is clumbsy and the categories inflexible. Pre-determined constructs prescribed by the technique, rather than being described by the data, provide no possibility of temporal evolution. The artificial dichotomy reinforces this: before urbanization, in traditional agrarian societies, differences in (say) family structure were mere reflections of variations in (economic) status; after urbanization they reflect positive choice between opposed life-styles. The question of what conditions obtained during transition between the polar types scarcely arose. In this sense, Social Area Analysis resembles the idea of 'Industrial Revolution' later superceded by Rostow's five stage transition model.

1.3 Factorial Ecology: The Multi-Variate Approach

The third and final forward "lurch" in the study of urban residential patterns also initiated recent steadier progress, and is distinguished therefrom purely for simplicity. Timms (1971, 55) describes the typical factorial ecology as:

> "the application of extensive factor analytic techniques to a wide range of demographic, socio-economic and housing data generated on a sub-area farmework. The analysis is founded on the belief that it will be possible to account for the manifold variation in neighbourhood characteristics in terms of a much smaller number of underlying constructs. The aim ..... (is) the reduction of the original n-sub-area by, s-variable matrix to an n-sub-area by m-factor matrix in which m, the number of significant factors, is considerably less than s. The criteria of significance reside in both the statistical properties of the factors, as accounting for a certain proportion of variance, and in their theoretical connexions"

The related techniques of factor and principal components analysis are usually applied to a product moment correlation matrix (s x s) representing the similarity of the distribution, across n-sub-areas, of each pair of variables in turn. Both seek to extract groups of variables with similar correlation patterns in this matrix by creating hybrid replacement variables, strongly correlated with the original variables, but themselves uncorrelated. The "factors" (or "components" in principal components analysis) are initially determined by arbitrary mathematical rules, often proving difficult to interpret until rotated so that some variables have high loadings on a given factor and near-zero loadings on others.

Factor and components analysis reveal the structure of a multi-variate data set by identifying groups of variables with similar correlation patterns across the areal units being studied. Since the twin methods isolate fundamental dimensions of variation in the input data, summarizing a large proportion of its total variance, they provide a relatively objective means of defining the axes of social differentiation. Hence factor and components analyses obviate the need for reliance on the Social Area constructs. Constructs can be generated from the data, for components are merely weighted sums, or linear combinations, of the original data. Robson (1969, 58) summarizes the argument.

> "To work towards the same end as the Shevky analysis while avoiding the weakness of selecting variables on the basis of predetermined deductive theory, the objective statistical means of multi-variate analysis obviously meet our requirements. Whereas the Shevky technique selects its constructs, and the variables which compose them, on the basis of possibly suspect theory, multi-variate analysis selects its discriminating factors solely on the basis of the inter-correlations of the data itself - and a large body of data at that."

By freeing research from the restrictions of a rigid set of constructs, multi-variate analysis allowed the development of ideas regarding both spatial and temporal variations in construct patterns. But research was not only freed from a rigid set of constructs, it was also freed from the rigid data requirements of that construct set. Assuming factors are

invariant under substitution of measures (see Timms, 1971, 61) the range of possible analyses is greatly widened and, it is argued here, even Britain's nineteenth century census returns provide suitable data though the details of rent, education and single family dwelling units, required by Social Area Analysis, are lacking.

There are also considerable disadvantages of factorial ecology which merit attention.

(a) "The variables included will obviously determine the results obtained and therefore the basis for the selection of the variables needs to be carefully considered. The multiplication of variables is often little more than replication of measures of the same sort. In some cases, a relatively homogeneous group is included since it is dictated by a theoretical concept, in others a whole rag bag is put together in the hope that something will turn up" (Carter, 1972, 266). There is clear evidence that the more variables included in an analysis which relate to a single Shevky construct, the more likely that supposed dimension is to break up into a series of more specific sub-factors (Timms, 1971, 59 re familism; ibid., 60 re ethnicity). The problems presented by variable selection are enormous (see Chapters 4-6). Variables required on theoretical grounds may be absent from the available data, while the similarity of factor structures from cities throughout the world might be attributed as much to their dependence on census data as to the existence of universal and fundamental dimensions of differentiation. The effect of variable selection may be largely excluded, however, by performing temporal comparison of the factor structures using the same variable set throughout. In this case the distortions due to the particular variables chosen will be fairly constant and observed differences are likely to be of substantive significance.

(b) "The components are mathematical artefacts and only by an arbitrary association with the variables can any meaning be given to them. When no

meaning is apparent the temptation is to try the exercise again with a more amenable set of variables" (Carter, 1972, 266). It has also been suggested that factoring procedures do not match the needs of the urban analyst very well for orthogonal components are extracted when in fact ethnic minorities are normally of low social status; family and socio-economic status dimensions may also be related (see for example Johnston, 1971b, 316-9).

(c) Factorial ecology "is only an analytical technique and in itself has no theoretical implications. It assumes that the basic problem is 'taxonomic rather than phomenological' (Abu Lughod, 1969, 198). It is a stimulant to theory formation; it can become a technique to bypass thought" (Carter, 1972, 226). This is probably the most serious criticism of factorial approaches. Williams (1971) argues that the reason for using factor analysis is provided afterwards when "any fool" can put up an a posteriori justification and interpretation of results which are usually "trivial platitudes disguised as 'conclusions' which could often have been derived by merely looking at the original data". An analysis yielding three factors resembling the Shevky constructs merely states the obvious fact that a city has rich areas and poor areas, family house districts and bedsitter belts, immigrant ghettos and quarters exclusively occupied by the native population. But once the concept of evolution in the factor structure is introduced the value of conclusions increases considerably. No longer are we limited to making perhaps rather obvious statements about the lines along which society is divided, but we can suggest how these dimensions developed, and what lines of division obtained in earlier periods.

(d) Although factorial ecology is increasingly popular there are several reasons why conclusions may not be directly comparable. "One of the major problems in interpreting the results of factorial ecology lies in the doubt whether the bounds of the set of areas for which the analyses are reported

are enclosing comparable systems" (Timms, 1971, 62). "Boundaries too narrow ..... may produce distortion through an overemphasis on the inner city mode of differentiation. Boundaries too wide ..... may introduce unwanted effects of the rural-urban mode of differentiation" (Sweetser, 1969, 455). This problem may be particularly important if temporal comparison is attempted for a single city over an extended period: on the one hand there will be a desire to adopt a standard boundary throughout the study; and on the other, the need to exclude rural environs of the early town before its modern limits of growth are reached. Timms (1971, 55) suggests other cause of incomparability. "Since the results of a factor analysis vary not only with the nature of the data input and the particular type of factor analytic technique employed, but also with the theoretical predilections of the investigators, any attempt to provide an overall summary of findings must be treated with caution ..... differences in the details of the factor structures produced in the various studies may reflect differences in data and techniques as much as underlying differences in the bases of residential differentiation."

Timms goes on to present a tabular comparison of a large number of factorial ecologies, and comments that "In view of the many differences in indicants, areas of study, and types of technique used ..... the most striking feature ..... is the general consistency of the findings" (ibid.). Despite the disadvantages of factorial ecology it appears to produce valid results, and is certainly the best technique currently available and widely used for the study of urban residential patterns. Its ability to provide output which allows testing of all three aspects of a form-function-process formulation commends it here, and it is felt that an awareness of the dangers of excessive dependence upon a single data source may mitigate some of the main disadvantages of a blind faith in one type of information. The approach to the data will inevitably be critical for it is one of the aims of the present work to assess the utility of factorial ecologies of nineteenth century Enumerators' Returns in testing a definite set of hypotheses.

1.4 Recent Progress: State Of The Art

Although recent advances in the study of urban residential patterns have influenced the present research no attempt will be made to provide an exhaustive chronological or thematic account of modern work and findings; several general texts cover the field adequately (Timms, 1971; Theodorson, 1961; Johnston, 1971a). Instead, attention will be given to those aspects of more recent literature which confirm the trend in factorial ecology towards the form-function-process approach which, it has been argued, is essential for a more complete understanding of urban residential differentiation. Recent advances are all more or less inter-related, with conceptual developments fostering and, in turn, being fostered by comparison of different factorial studies. Nevertheless it seems desirable to separate major trends in the current literature so as to provide a clearer description of progress towards the preferred approach. Accordingly, the following sections describe respectively the development theory linking process and function, the development of that linking form and function, and the piecing together of a comparative methodology and conclusions.

1.41 The Developing Process-Function Approach: Towards a Theory of Factorial Evolution

The effective dichotomy presented by Shevky and Bell sidestepped important issues. Not only did their presentation of polar types (traditional agrarian v modern industrial) avoid questions regarding the intervening period of change, but it also ignored the possibility that no single process could be identified with the concept of increasing societal scale. For once the existence of an evolving factor (or construct) pattern is admitted we have no reason for assuming that all three of the major dimensions of differentiation emerged together or developed at the same rate. In particular, there may be many circumstances in which the ethnicity dimension developed almost separately from the other two and in response to external

factors largely unrelated to the process of urbanization. Certainly the British example suggests that the reverse case might arise: an ethnicity dimension might be detected well before socio-economic status and familism have emerged as separate and independant dimensions, because of the influx of Irish immigrants caused largely by the Potato Famines after 1845.

The need for a more evolutionary approach did not go unnoticed. McElrath (1968, 33) asserts that "change in the organization of developing societies is accompanied by changes in the dimensions of social differentiation - those categories into which people are divided, and in whose terms they receive differential treatment by others." Residential differentiation is to be seen as a function of these evolving dimensions of social differentiation. The patterns of differentiation in a city therefore indicate the state of the total society - being not a random sample of that society but the growing edge of large scale organization. McElrath's ideas clearly developed on the basis of a comparative view of factor structures: he stated, for example, that the social areas of Rome and of American cities were inter-related in a way that "may be meaningfully interpreted in terms of the differences in the scale of Italian and American society" (McElrath, 1962, 377). Nevertheless he made significant theoretical contributions which merit particular attention.

According to McElrath (1968, 33-52) social differentiation derives from four broad structural changes. Changes in (a) the distribution of skills, and in (b) the organization of production were both facets of industrialization. Changes in (c) the aggregation of population, and in (d) the distribution and redistribution of resources within society derived from the concentration and control of work in cities, and so formed aspects of urbanization. If all four changes resulted from increasing societal scale they should be highly positively inter-correlated, and international rank-order correlation tests suggest this is the case (Freeman and Winch, 1957,

reach parallel conclusions). McElrath also uses factor analysis to test for "single-factoredness", and although two tests indicate only one factor a more stringent test rejects the hypothesis of single-factoredness; he therefore concludes that the variations are all closely related to a single factor which is interpreted as "organizational scale".

Table 1.2 presents McElrath's analysis of social differentiation and consequent areas of residential organization. The most important "changes in the distribution of skills" derive from the increasing demands of formal organizations accompanying industrialization. Demand for communication skills and the wider range of non-manual jobs make literacy and education important to the individual as doors to "participational structures" (McElrath, 1968, 34) in the society. Differences in skill underlie the social rank dimension. Similarly, the family status dimension derives from changes in the organization of production, as measured by (a) movement of labour out of agriculture, (b) industrial diversification, and (c) an increasing proportion of wage and salary workers. As work shifts from the household to factory, office or shop, women participate in the labour force outside the home and children no longer perform productive roles. According to McElrath's view, industrialization allows some families to "eschew children" and send the wife to work, "while others remain in the traditional, subsistence agricultural world". It must be remembered that he was introducing research on Accra, Ghana where such a pattern seems quite likely. In the developed world, however, it is preferable to regard the family status dimension as reflecting a choice between female participation in the labour force (and other aspects of career and consumption orientations) on the one hand, and a large family on the other.

As development progresses an increasing proportion of society is needed to perform city-based control and co-ordination functions. The resultant aggregation of population means migrants comprise a substantial

Table 1.2 McElrath's View of Social Differentiation

Master trend	Distributive changes		Dimensions of social differentiation	
	Historical changes	Indicants of change	Constructs	Sub-area indicants
Industrial-zation	Changing distribution and reward of skills	Literacy Further education Commerce workers Non-manual workers	Social rank	Occupation Education
	Changing structure of productive activity	Non-agricultural workers Industrial diversity Wage and salaried workers	Family status	Fertility Women in workforce
Urbanization	Aggregation of population	Urban concentration Metropolitan concentration	Migrant status	Distance: birthplace Selection: age-sex structure
	Increasing dispersion of resources	External relations Immigration rates	Ethnic status	Culturally visible minorities

Source: Timms, 1971, 132. Adapted from McElrath, 1968, 35.

proportion of the population of growing cities, and to the extent that migration affects participation in urban life, people are differentiated by their migration status. In urbanizing societies many migrants come from distant areas, crossing social and cultural boundaries as a result. Cities in such societies contain many members of ethnic minorities who are (often) denied equal access to opportunity, reflecting differentiation by ethnic status.

Unlike Shevky and Bell, McElrath distinguishes between differentiation by migrant status and that by ethnic status. This may be particularly useful in analysing British cities, particularly if the ethnic minority groups are relatively small. Recognition of two separate dimensions is an interesting approach but it is open to doubt whether there is any sound justification for such a drastic step. In the extreme case a British city might have two major migrant elements. The Irish population might conform with all the predictable patterns for an ethnic minority group which has recently arrived in the city, being concentrated heavily in a limited area of substandard, overcrowded housing. The other migrant element might conceivably be largely at the other end of the social spectrum forming, not the underpriviledged group, but (part of) the elite. This situation might arise if the most mobile element in English society was an educated body of professionals, such as doctors, lawyers and teachers. Naturally such a group would be over-represented in the areas of better housing. But are we justified in suggesting that, in these unlikely circumstances, there is a fundamental difference in the nature of the two cases of social and residential differentiation? Is it not equally valid - and perhaps more useful - to regard the contrasted minorities as different manifestations of a single process? In the present example we might describe a factor structure which contains two 'minority group' dimensions. The two factors would reflect the differential access of minority groups to opportunity.

Despite this criticism McElrath provides a view of residential differentiation which is more easily defended than is the Shevky-Bell approach. In particular, his separation of industrialization and urbanization as separate aspects of increasing organizational scale is useful just because it specifies the relationship between the two processes. For the full expression of industrialization a large population must be employed in controlling, co-ordinating, and communicating functions, and these functions must be performed centrally. Over and above the industrial concentration of population (relying on internal and external economies of scale), there is a need for centralization of control and communication. Similarly there is a need to develop resources, including untapped pools of labour, which are further and further away from the centre of activity. Consequently, urbanization includes both an aggregation of population in cities, and an increase in the scope of activities that are interdependent with urban centres (i.e. the expansion of the urban hinterland). To summarize, McElrath provides a more convincing link than did Shevky and Bell, between overall social changes, and the dimensions of differentiation which define urban residential patterns. His comparison of factor structures from cities at differing levels of development (Accra; Kingston, Jamaica; Rome; and American cities) clearly suggests that the dimensions of residential differentiation evolve predictably as development progresses.

Another approach to essentially the same problem is provided by Abu Lughod (1969). Whereas McElrath appears to have approached residential differentiation from the theoretical stance provided by Shevky and Bell, Abu Lughod approaches the subject from the viewpoint of a factorial ecologist by seeking to define the preconditions of the emergence of the major dimensions of differentiation as factors in a particular analysis. Like McElrath, she undoubtedly bases some of her conclusions upon a comparison of factor structures in the developed and developing worlds,

but her approach is interesting. By attempting to define preconditions for the emergence of particular factors, she provides grounds for a defence of factorial ecology. Early inductive work is unavoidable: all the natural sciences passed through a period when collection of empirical evidence formed the major part of their activities. But once the initial stages are completed, consistent patterns are discerned and generalizations made. Eventually the whole process of hypothesis development and testing emerges. Early factorial ecology was often inductive, but the search for generalizations has begun. Abu Lughod's analysis of Cairo was performed to test the hypothesis that in societies of smaller scale "intra-urban differentiation is less complex" (ibid., 189) than in modern cities where at least three separate dimensions are required to explain intra-urban variation. In both 1947 and 1960 half of the total variance was accounted for by a single "life style" dimension upon which "both social rank and family life variables loaded heavily" (ibid.). Elsewhere (Abu Lughod, 1968, 21) she states that "no factorial separation between indicators of social rank and the indicators of family cycle stage could be obtained".

The published account of the conditions that are necessary and sufficient to produce the social rank and family status dimensions normally found as independent dimensions in American cities (Abu Lughod, 1969) is, in some respects, less satisfactory than the description of an earlier version (Abu Lughod, 1968) presented by Rees (1970, 318-9). The present statement therefore combines elements of both papers.

The conditions necessary for the emergence of an independent socio-economic status dimension from the specific variables of occupation, education and income are: (a) "that the effective ranking system in a city be related to the operational definition of social status" (Abu Lughod, 1968 quoted in Rees, 1970, 318), and (b) "that the ranking system in a city be

manifested in residential segregation of persons of different rank at a scale capable of being identified by the areal units of observation used in the analysis" (ibid.). Abu Lughod explains (1969, 189-212) that if socio-economic status were determined by criteria untapped by the specific measures used (which were adapted to analyse "modern" cities) and/or if residential differentiation was absent or occurred according to principles unrelated to socio-economic status, the dimension would not be identified in a factorial ecology.

The conditions listed as necessary for the emergence of a family status dimension, either independent of or coalesced with the socio-economic dimension, are (a) "that family types vary, either due to 'natural' causes such as those associated with sequential stages in the family cycle, or to 'social' causes such as those associated with other divisions in society, whether ethnic, socio-economic or other" (Abu Lughod, 1968, quoted in Rees, 1970, 318), and (b) "that sub-areas within the city are differentiated in the attractiveness to families of different types" (ibid.) "at a scale capable of being identified by the areal units of observation used in the analysis" (Rees, 1970, 318). In introducing these two necessary conditions Abu Lughod (1969, 189-212) describes the extreme situation where no family status dimension could emerge because the extended family was so dominant that stages of the samily cycle were played out within large stable households (rather than in sequential residential settings); fertility, family size, and propensity to maintain extended families were the same for all classes, ethnic groups etc.; and housing attractive to particular family types was randomly scattered through all sub-areas of the city. These remarks are particularly important since they identify three of the key issues examined in Chapter 5.

Finally Abu Lughod suggests the circumstances under which socio-economic status and family status would form two independent dimensions of residential differentiation. The simplest condition would obviously

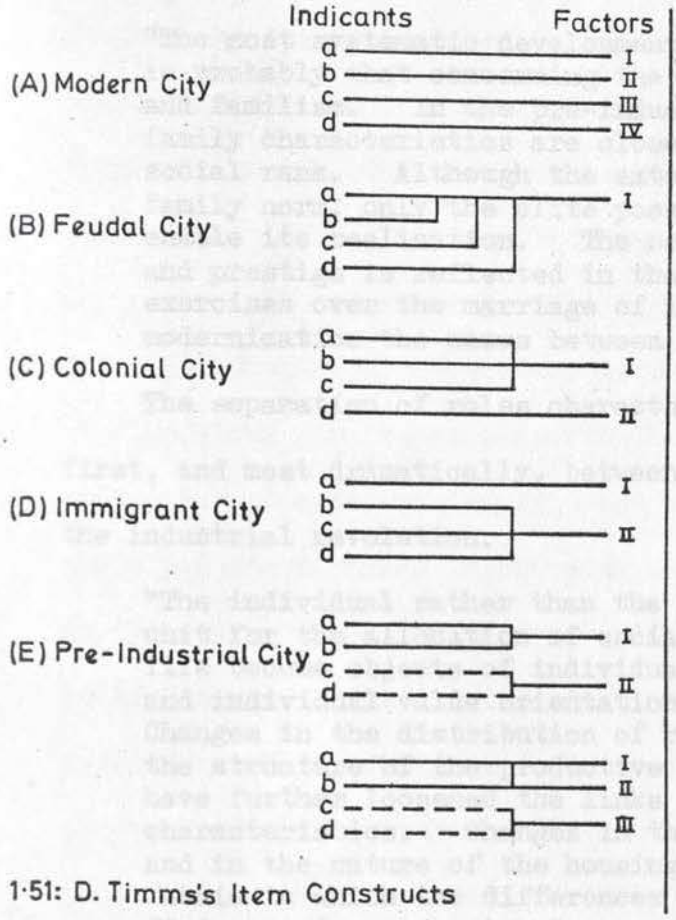
be the existence of little or no association between social class and family type; but given a significant association of this type, socio-economic status and family status might still be dissociated if (a) "there is a clear distinction between stages in the family cycle, each stage being associated with a change of residence" (Abu Lughod, 1968, quoted in Rees, 1970, 318); (b) "sub-areas within the city offer, at all economic levels, highly specialized housing accommodations especially suitable to families at particular points in their natural cycle of growth and decline" (ibid.) "at a scale capable of being identified by the areal units of observation used in the analysis" (Rees, 1970, 318); and (c) cultural values encouraged mobility to maximize housing efficiency, free from the frictions of sentiment, local attachments or restrictive regulations. In Cairo class fertility differentials persisted and therefore family status and socio-economic status were closely linked; views differ regarding the class specific fertility patterns in nineteenth century England, but the possibility of class fertility differentials cannot be ignored.

Timms (1971, 138-149) considers these theoretical developments and some of the empirical evidence before making his own contribution to the question of evolving factor structures. "Only in the modern city possessing a diversified residential fabric and a well differentiated social structure, may it be anticipated that each construct will emerge in the manner postulated by the basic social area model. Elsewhere, variations in the patterning of the indicant-construct relationship will reflect the degree of modernization in the encompassing society." (ibid. 145) He presents a diagram (Figure 1.51) showing the different factor patterns which might arise given different degrees of modernization in the hope that it might hasten the development of a detailed theory of comparative urban ecology.

Accepting McElrath's "migration status" axis as a dimension worthy of separate recognition, Timms suggests that, in the modern city

(type A in Figure 1.51), each of the four constructs is "unambiguously related to its specified indicants and each indicant is a relatively 'pure' measure of its theoretical projection. ..... Each set of indicants shows high item-factor correlations with its relevant construct and insignificant correlations with all other constructs. Each factor is relatively independent of all others." (ibid.). Type B in Figure 1.51 represents the opposite extreme, such as might have been the case in feudal cities, with all indicants varying together and reflecting "a single basis of social and residential differentiation. ..... Given the heterogeneity of the urban population, however, it seems unlikely that such a structure could long survive" (ibid.) and Timms therefore suggests that the mixed types (C to F in Figure 1.51) "provide a more likely set of templates for the analysis of the pre-modern city" (ibid.).

Timms argues that trade or conquest may produce ethnic and/or migration differentials, but since minorities will rarely have the same access to local opportunity structures as the host population the separate migration or ethnicity axis will often "exhibit a marked correlation with the principal axis of differentiation found in the host population" (ibid.). In the colonial city (type C in Figure 1.51) origin or ethnicity is closely linked with the local power system, so ethnicity and social rank may form a single factor with minority groups pre-empting higher social strata. Type D in Figure 1.51 represents fast growing immigrant cities with a close association between life style and ethnic or migration status dimensions. A factor pattern of this type might be expected in an English city flooded by Irish immigrants, but since - in the period studied - Wolverhampton was also undergoing rapid modernization it is unlikely that the situation will be so clear cut. Types E and F in Figure 1.51 represent the pre-industrial and industrializing city respectively and since Timms' comments are of central interest to the present analysis they will be quoted at some length, (Timms, 1971, 147).



a = Socio Economic Status b = Family Status c = Ethnicity d = Migrant Status

Figure 1·5: Two Views of Factorial Evolution

Adapted from Herbert (1972, 178)

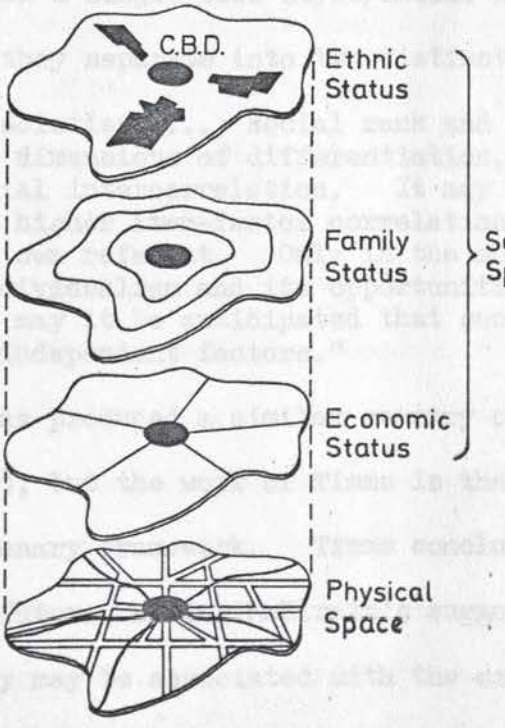


Figure 1·6: A Generalized View of Form and Function

> "The most systematic development accompanying modernization ..... is probably that concerning the association between social rank and familism. In the pre-industrial city ..... differences in family characteristics are closely associated with differences in social rank. Although the extended family may be the preferred family norm, only the elite possess the necessary resources to enable its realization. The necessity to preserve inheritance and prestige is reflected in the tight control which the family exercises over the marriage of its members. With the process of modernization the nexus between rank and family is greatly attenuated."

The separation of roles characteristic of social mobilization occurred first, and most dramatically, between family and occupational roles during the industrial revolution.

> "The individual rather than the extended kinship system becomes the unit for the allocation of social rank, and marriage and style of life become objects of individual choice, resting on romantic love and individual value orientations, rather than ascribed class. Changes in the distribution of resources, in medical knowledge, in the structure of the productive activity and in the role of women, have further loosened the links between social rank and family characteristics. Changes in the organization of the building industry and in the nature of the housing market have created a residential fabric in which the differences in the preferred ways of life can find a ready expression."

Dissociation between social rank and familism may provide an index of the degree of modernization of a society: in the pre-industrial city both sets of variables load on a single life style/social status factor, but as modernization procedes they separate into two distinct axes.

> "In transitional societies ..... social rank and family status will emerge as separate dimensions of differentiation, but they will exhibit a substantial intercorrelation. It may be that some indicants of the one exhibit higher item-factor correlations with the other than they do with their own referent. Only in the modern metropolis, with its emphasis on individualism and its opportunities for expressing individual choice, may it be anticipated that social rank and familism will become fully independent factors."

Rees (1970, 307) has produced a similar summary of possible factor structures (Figure 1.52), but the work of Timms is the more telling because of its explicit evolutionary framework. Timms concludes his argument with a possible view of the future, noting McElrath's suggestion (1968, 34) that modernization of society may be associated with the emergence of an ever increasing number of differentiating dimensions and indicating grounds for

the idea that once important bases of residential differentiation may lose their significance over time (Timms, 1971, 148) as may already have happened for religious differences (though Duncan, 1959, disagrees). These possibilities warrant serious consideration because they suggest that any conceptual framework must be very flexible to cope with the emergence of new dimensions and the disappearance of old ones.

Together, the ideas of McElrath, Abu Lughod, Rees and Timms form an embryonic process-function approach to urban residential differentiation and a tentative theory is emerging which relies upon a predictable evolution of the dimensions of residential differentiation as a central feature of social change. But, as the label 'process-function' implies, the emerging approach does not fully satisfy our theoretical needs. In particular, the work of McElrath is almost devoid of reference to spatial aspects of urban residential patterns, and while Abu Lughod and Timms are careful to mention factors with spatial implications they too broadly ignore form. For a social status axis to emerge Abu Lughod requires (1968, quoted by Rees, 1970, 318) "residential segregation of persons of different rank"; for a family status axis sub-areas of the city must be "differentiated in their attractiveness to families of different types" (ibid.); and for the two to be independent may require that "sub-areas within the city offer, at all economic levels, highly specialized housing accommodations suitable to families at particular points in their natural cycle of growth and decline" (ibid.). Timms merely relies on changes in the building industry and in the housing market to create a residential fabric which allows ready expression of differences in life style preferences (Timms, 1971, 147). Some ideas about form were gleaned from Burgess and Hoyt; during rapid urban growth, peripheral expansion, central subdivision and a filtering of population outward ensures a differentiated housing stock. But since neither Burgess nor Hoyt provided a clear view of the functional bases of

residential patterns, it is difficult to integrate their ideas about form with the more recent 'process-function' approach. The limited time scale of Burgess and Hoyt makes an integration via process unlikely. Hence we have a viable 'process-function' approach and a set of useful ideas about form but the two appear irreconcilable. The following section addresses this problem.

1.42 Towards a Form-Function Approach

The problem outlined above stems from the failure of the Burgess and Hoyt models to provide a set of functional categories suitable for analysis of urban residential structure. The solution proved simple. A factorial ecology may be used not only to suggest axes of residential differentiation, but also to work back again to the areal units for which data were submitted, calculating a score for each area on each differentiating axis. Plotting these "factor scores" cartographically furnished a crude form-function view of urban neighbourhoods. Scores were found to form definite spatial patterns - often resembling the zonal or sectoral models. Anderson and Egeland (1961) compared the two models with spatial variations in 'prestige value' (or social status) and 'urbanization' (family status) in four circular American cities with populations between 0.2 and 0.5 million. Burgess's concentric zone model was supported for urbanization but not for prestige value, while Hoyt's sectoral model was supported for prestige value but not for urbanization. It is suggested, however, that the absence of any marked concentric pattern for prestige value may be limited to small and medium-size cities: prestige value did vary with distance from the city centre in the largest case studied. Ethnicity was not studied on the grounds that negro distributions in large American cities are not known to fit either the zonal or the sectoral model.

Anderson and Egeland merely applied analyses of variance to the Shevky-Bell social rank and family status constructs. Later work provided

some theoretical underpinning, and empirical evidence. Berry (1965) formally suggested that the two models were not alternative but complementary elements of urban structure. He saw the spatial organization of the city's residential areas in terms of (a) "the axial variation of neighbourhoods by socio-economic rank; (b) the concentric variation of neighbourhoods according to family structure; and (c) the localized segregation of particular ethnic groups." (ibid., 115). Socio-economic status was indexed by the functionally related variables of education, occupation, income and rent, which therefore varied together across the city - by sectors. "High status sectors ..... follow ..... amenities desired for housing, such as view, higher ground, and so on. Lower status sectors follow lower lying, industrial-transportation arteries that radiate from the central business district and which, together with that district, form the exogenously-determined skeleton of the city. ..... The lower the income the closer is home to work." (ibid.). By contrast age structure varied concentrically with distance from the city centre, as too did age of housing, density, incidence of multiple unit structures, owner-occupation, and female participation in the labour force. "Thus, at the edge of the city are newer, owned, single-family homes, in which reside larger families with younger children than nearer the city centre, and where the wife stays at home. Conversely, the apartment complexes nearer the city centre have smaller, older families, fewer children, and are more likely to be rentals; in addition, larger proportions of the women will be found to work" (ibid., 115-6). Finally, ethnic minorities lived in segregated parts of the city with poor household amenities, bad housing conditions, and overcrowding.

"If the concentric and axial schemes are overlaid on any city, the resulting cells will contain neighbourhoods remarkably uniform in their social and economic characteristics. Around any concentric band communities

will vary in their income and other characteristics, but will have much the same density, ownership, and family patterns. Along each axis communities will have relatively uniform economic characteristics, and each axis will vary outwards in the same way according to family structure. ..... The ..... patterns of segregation ..... are geographically specific to the particular city ..... The three classic principles of internal structure of cities are thus independent, additive descriptions of the social and economic character of neighbourhoods in relation to each other and to the whole." (ibid., 116).

Figure 1.6 expresses Berry's views spatially and was produced by Murdie (1969) in a factorial ecology of Toronto demonstrating the socio-economic status is sectorally arranged while family status tends towards a zonal distribution. Salins (1971) provides confirmation, but other evidence is less favourable. Both McElrath (1962) and Rees (1968, cited in Timms, 1971, 233) show that both socio-economic status and family status vary zonally and sectorally. Rees shows that when the whole of Chicago metropolitan area is analysed the zonal effect is the greater for both factors. Analysis of a smaller area (Chicago's housing and labour market) shows the zonal effect is less important than the sectoral in the distribution of social rank, but more important in that of family status (ibid.). Rees also suggests that the bigger the city the greater the relative importance of zonal variations in social rank and of sectoral variations in family status, though each remains the subsidiary effect (ibid.).

There is much criticism of this work (see Johnston, 1971a, 332-5) for use of analysis of variance, regardless of intra-area variations, on a rigid geometrical framework and without adequate attention to the form of the zonal gradients. Nevertheless it seems that mapping of factor scores for individual cities provides one means of assessing the value of the various urban structure models in the case concerned, and the rationale

provided by Berry sheds some light upon the relationships - in the modern city - between form and function. More detailed analysis will probably require full examination of the forces leading to the differentiation of the housing stock within a city, and therefore fall beyond the scope of Berry's generalization. For a comprehensive analysis Social Area Analysis and factorial ecology are too social in outlook, the zones and sectors of the developing form-function approach too abstract. The link with real space, and the evolution of 'housing areas', must ultimately be incorporated too, but this limitation must not obscure the very real contribution of the emerging form-function approach to a view of urban residential differentiation.

1.43 The Seeds of a Form-Process Approach

Generalizations about the non-social aspects of urban residential patterns are rare, possibly because of the unique character of the physical fabric of each urban area. Moreover, there are no analyses of changes in urban form at the city-wide level which may usefully be linked with a factorial approach to the overall problem. Though Lynch and Rodwin (1958) present the major elements of a description of urban form, this is not applied to important changes through time. But Conzen (1960) has recognized cycles of morphological development applicable at a detailed level. For each burgage plot four stages are recognized: in the 'institutive' phase the street fronting property is developed but the rest of the plot is empty; this is slowly built up in the 'repletive' phase, until 'climax' development is reached; thereafter 'succession' occurs with the demolition of some or all of the plot's building cover. The technique is applied at a less minute scale than that of the individual plot by Straw (1967, Chapter 10) in an analysis of Nottingham's major street blocks. Between 1800 and 1844 31 of the 67 blocks passed through their main phase of repletion; another 18 blocks saw similar development between 1844 and 1885.

Thirty nine (58%) of Straw's street blocks reached a climax in building coverage in the late nineteenth and early twentieth centuries, with coverage exceeding 50-60%, and tended to decline thereafter. This pattern led Blumenfeld (1954) to speak of a "tidal wave of metropolitan expansion". The idea is developed further by Mills (1973), who describes five phases of suburban growth. In the 'pre-suburban' stage population and residential development are small; both grow rapidly during the phase of the 'incipient suburb' and the following 'developing suburb' epoch. In the 'mature suburb' growth slows and then ceases and decline may set in in the 'redeveloping suburb' as the wave of urban growth has passed much further outward. A similar idea is expounded by Duncan et al (1961-2).

It might be protested that this viewpoint is not particularly relevant in the modern city where new development is often completed at a stroke without gradual infilling and intensification of use. The point is valid, though even in corporation housing estates high rise flats and maisonettes are sometimes added to raise densities and lower per capita service costs, and Best and Champion (1970, 25) suggest a similar process may operate in housing generally. Nevertheless development is far more a 'once-and-for-all' process than during the nineteenth century. For this period of rapid urbanization, however, Conzen offers a very useful 'form-process' view of urban form which corrects the excessively social outlook of the other approaches examined so far by its reference only to the physical fabric of the city.

1.44 The Developing Comparative Approach

Berry (1971) has examined the field of comparative factorial ecology in detail (in a Supplement to Economic Geography) which provides numerous examples of the genre. Four facets of the developing comparative approach merit discussion here.

Firstly it must be admitted that many "comparative factorial ecologies" are nothing of the sort, for different situations are rarely examined in a single analysis. What comparison there is has tended to be verbal rather than quantitative, with detailed description of the similarities and differences between separate factor structures. This has provided inductively based, rather imprecise generalizations that have stimulated theoretical development and integrated subsequent research. Cross-cultural comparison, for example, has developed around the hypothesis that differentiating areas vary predictably with the degree of modernization of the society. Clearly, the role of such generalizations is an important one.

Secondly the importance of cross-cultural findings must be acknowledged. Cross-cultural comparison has often been used to test hypotheses suggesting a temporal evolution of urban residential structure because of the availability of similar census data for cities in widely contrasted cultural settings. The differences between a 'modern' American city and a 'traditional' Asian one, might be roughly equivalent to a time-lag of a century or more, and while similar data might be available for both cities in 1971 it is unlikely that the American city could furnish similar data for, say, 1871 and 1971. Comparison of widely divergent cases is also effective when unexpected differences emerge for this may highlight the culture-dependent nature of our view of urban structure.

Accepting the validity of attempts to identify cross-cultural comparison with different stages in the modernization process, two types of comparison would be of interest: comparison of factor structures (or function) and comparison of spatial pattern (form). Both are represented in the literature. McElrath (1968) compares the factor structures of Accra, Kingston, Rome and eleven American cities and concludes that social rank occurs as a dimension of differentiation even where the distribution of skills reveals only limited advance (Accra; Kingston), but is more

independent of family status where these changes are well developed (Rome; U.S.). Family status does not operate independently where changes in the structure of production are small (Accra), but is independent where such changes are slightly more advanced (Kingston) and this independence increases with societal scale to a maximum in U.S. cities (ibid., 49-50). Comparisons of more limited extent also provide valuable insight. Van Arsdol et al. (1958) compare ten medium-sized U.S. cities. Six of these conformed to the three dimension Social Area model. All of the four cities which failed to do so were in the South and revealed an association between fertility and socio-economic status. The high proportions of Negroes in these four cities, and their unfavourable economic position might, it was suggested, "indicate that the range of family forms in these cities, as described by the fertility measure, has not yet become disassociated from social rank" (ibid., 282).

Commenting on his own work in Winnipeg, and that of Van Arsdol et al. (1958) and McElrath (1962), Herbert (1972, 176-7) concludes,

> "The implications of these various studies was that they would cease to be deviant cases over time as family status became independent of socio-economic status and as a more mobile population was catered for by an improved and more specialized housing market."

Similarly, comparing the work of Abu Lughod (1969) and of Berry and Rees (1968), Herbert (1972, 177) writes,

> "In both the Cairo and Calcutta studies, a process of change was emphasized which might take the urban ecology towards the form identified in developed countries, though some cultural variations could prevail."

Though many studies indicate that a different spatial form characterizes cities in developing societies (e.g. Alonso, 1964b) most generalizations are abstract, referring to centre and periphery rather than to the physical fabric of the city concerned. This facilitates comparison but hampers understanding of the various relationships between social patterns and the man-made physical environment of the city. Berry and Rees (1968, 489),

for example, compare Indian cities with Chicago. Calcutta's high status residential areas were near the city centre; in Chicago the most desirable residential sites fronted the Lake. Otherwise Calcutta's pattern was the inverse of Chicago's for high status decreased rather than rising with distance from the centre. In Hyderabad low status zones were peripheral or industrial while high status areas were at the city's economic core. Timms (1971, 220) quotes many more factorial ecologies suggesting that, contrary to the pattern in a 'modern' city, high status areas in many Asian, Latin American and some European cities are centrally located, because of the prestige value of such a location, and that status declines towards the periphery.

Thirdly, we must examine the development of temporal comparison. Temporal comparisons are less common than cross-cultural ones, but new techniques are being developed which make quantitative comparison easier, and these are likely to encourage temporal studies. Before examining the evolving comparative methods it is worthwhile drawing attention to the work of Warnes (1969 and 1972) who compares a factorial ecology for Chorley in 1851 with what he is able to establish about the town before that date. The essence of the change revealed is from a residential differentiation by occupation (for transport was poor and industries spatially distinct) to one based upon status. "The analysis has demonstrated that by 1851 individual occupations were not the most important determinants of residential differentiation. Instead, generalized groupings of occupations on the basis of status and skill had become pre-eminent, although they were still not entirely divorced from individual occupations and industries. In this respect, the Chorley evidence adds weight to the claim that only in the most modernized societies are the socio-economic, familism, and ethnic components independent." The evidence also suggests "that a significant change in the nineteenth century was the declining importance of

occupation in determining ..... demographic patterns and residential location." (Warnes, 1972). Warnes continues by describing how factories created new employment opportunities and accentuated the divorce of home and workplace so that other factors could influence residential location: he sees the creation of large-scale employment units as a necessary, if not sufficient, condition for the emergence of residential areas distinguished by concentrations of status groups or population cohorts.

In Chorley, Warnes shows, the higher status groups lived in the central area simply because all people lived very close to their employment. "This is an obvious consequence of the low degree of spatial mobility characteristic of all cities which have not adopted late nineteenth century and subsequent transport technologies. By no means all cities in the nineteenth century had the strong religious or governmental functions that sustained the elite in the feudal city, but most had several growing industrial functions, each with its own characteristic locations" (Warnes, 1972). Finally, Warnes notes, the role of improved spatial mobility in transforming urban residential structure must not be exaggerated, for the changing organization and scale of employment was at least as influential in Chorley before 1850. Warnes not only provides further grounds for our expectation of evolution in the dimensions of residential differentiation, but also suggests pre-existing patterns, and patterns specifically relevant to nineteenth century England. The methodological limitations of his work, however, mean that no technique is offered which could be used in a rigorous temporally comparative factorial ecology; for a more suitable method we must look elsewhere.

Finally we must outline the development of temporally comparative techniques. Simple verbal comparison of two factor structures from the same variable set for different censuses is a slight improvement on Warnes's approach: at least like is compared with like. Hunter (1971) adopts this

technique for Chicago 1930-60 and points to the stability of the pattern revealed. Murdie (1969) also presents such a comparison of factors in Toronto in 1951 and 1961, but the subjectivity of such an approach leads him to a more quantitative technique of handling change. Improving the technique adopted by Sweetser (1962) which relied upon an index of relative change, Murdie proposed a "relative change quotient" standardized by comparison with change in the variable for the city as a whole. Whereas the simple index of relative change reflects the change in any variable for two censuses on each areal unit, and may assume huge values given minor absolute change from an infinitessimal base, Murdie's quotient was perhaps less volatile being of the form $P_{ij61}/P_{ij51}/P_{j61}/P_{j51}$, where P_{ij} is the value for area i on variable j in the 1951 or 1961 census, while P_j represents that variable's value in the same census for the city as a whole. Two matrices, showing variables by areas for 1951 and 1961, could therefore be combined into a single matrix of relative changes between 1951 and 1961 so long as the variable lists were identical. The matrix of relative changes was then factor analysed. There were problems, however, for an arbitrary upper limit to the relative change quotients was still required and results showed a relatively low level of explanation. Even so the main directions of change between the two censuses were clear enough to be labelled suburbanization, ethnic change and urbanization (a family status dimension). Murdie admits that the matrix of change contains far more random noise than the standard variable list, but stresses the changing spatial pattern between 1951 and 1961. Brown and Horton (1970) use a change coefficient of the form $P_{ij60} - P_{ij50}/P_{ij60}$ specifically to investigate changing spatial patterns in Chicago. The main change characteristics isolated were "occupational polarization" (a rise in the proportion of renters), "income profile" (salary increases), "life cycle profile" (proportionally more households in the middle life cycle) and "ethnic compositi

(proportionately more Negro households). The spatial form of the first two dimensions was decidedly concentric with rising proportions of renters and declining incomes characteristic of the central city. Clark et al. (1973, 20) point out that the method can 'make change happen' because of the weights given to the variables.

Hunter (1971) avoids many of the problems of the various indices of change by analysing crude changes in the value of the variables themselves without standardized expression. This "structure of ecological change" produces very variable factors of change and the technique is therefore held to be inferior to an examination of the change in the ecological structure derived from comparison of simple analyses for 1930, 1940, 1950 and 1960 in turn.

Alternative techniques are, however, available. Murdie (1969) in fact also used Harman's coefficient of congruence (Harman, 1960, 268-72) to measure the similarity between the results of his two cross-sectional analyses, 1951 and 1961, as represented both by the two factor loading matrices and by the two matrices of factor scores. A similar technique was adopted by Haynes (1971) working on Montreal in 1951 and 1961. The first dimension of differentiation was shown to be socio-economic status in both 1951 and 1961, and though it remained basically sectoral in spatial pattern, change between the two censuses was nucleated. Family status, the second dimension remained zonal throughout, but the pattern of change was not comprehensible. But probably the furthest reaching analysis is that of Johnston (1973) working on Melbourne in 1961 and 1966. Johnston compared the change coefficient technique with an extension of the congruence coefficient technique, stressing the superiority of the latter. Cross-sectional analyses of a 28 variables by 105 areas matrix for 1961 were compared using congruence coefficients, and the great similarity of the two structures was revealed (cf. Schmid et al., 1958, showing the

stability in U.S. cities between 1940 and 1950). Then the two matrices were combined and the 28 x 210 matrix subjected to principal components analysis yielding a component score for each area for both 1961 and 1966 which would be directly comparable if the residential structure described by the composite analysis was similar to that in the two separate analyses. Because of the structural stability of the residential pattern over the period this proved to be the case, allowing differences for any area to be derived by subtraction and the amount of change to be analyzed directly. This technique is only useful "if the basic dimensions ..... remain unaltered" (Clark et al., 1973, 20) and is of little value in a context of rapid urbanization and change.

The most advanced methods of handling temporal change are, as yet, little used. Three mode analysis of a data cube is possible (embracing variables x areas x times), but programs are not readily available and few studies of this type have been published. Cant (1971) provides a spatial and temporal analysis of New Zealand's industrial structure, but interpretation proved difficult. Conclusions provide ample grounds for ridicule, for the two factors isolated on the time dimension were the 'continuing pattern' - the dominant factor - and 'recent change'.

Despite the problems a viable method of temporal analysis is emerging. Interpretative difficulties and the absence of accessible programs limit the applicability of three mode analysis; and the requirement of structural stability in Johnston's combined analysis procedure make it unsuitable for examination of near-revolutionary change. But change indices and congruence coefficients provide alternative lines of attack which may be of considerable value in defining the processes involved in the evolution of urban residential structure.

1.5 Conclusion

> "Significant problems have to be identified; clear conceptual analysis and theory-building carried out. Operational models have to be built with a clear focus on the task of explanation, not just description, and those models have to be tested. And then the process must be repeated, revised, theories adjusted or rejected and new models constructed. Factor analysis can play a part in this process, where it has an appropriate role" (Rees, 1971, 233)

It has been argued that temporal comparison of factorial ecologies has a major role in testing hypotheses about the formal, functional and evolutionary aspects of urban residential structure. The development of theory and of methodology has been traced, and the necessity for progress towards an ultimate form-function-process approach has been emphasized. Two needs are now apparent. Firstly, a generalized form-function-process model must be explicitly stated, providing predictions for cities at varying stages of development. Secondly, these predictions must be compared with the experience of a single city undergoing industrialization and urban growth; no longer should we have to rely upon international comparisons which may be distorted by numerous extraneous influence - direct evidence of temporal evolution is essential. Perhaps most pressing of all is the need for evidence of a temporal evolution of dimensions of residential differentiation during industrialization and urban growth. Such a process-function view of a single city is also a pre-requisite of the holistic form-function-process approach. The remainder of the present study is therefore devoted, in particular, to the detailed elaboration of a process-function model and to its application to mid-nineteenth century Wolverhampton. Above all, an attempt will be made to provide evidence from a single city of the hypothesized temporal evolution of the dimensions of residential differentiation during industrialization and urban growth. Before presenting the general model and offering specific predictions, however, it is desirable to consider some of the limitations of the factor ecological view as it has been developed so far. It should then be possible to place the present study in a more comprehensive framework which provides a place for elements beyond the scope of a census-based process-function methodology.

CHAPTER 2 KEY ELEMENTS IN A MODEL OF URBAN RESIDENTIAL STRUCTURE

It has been argued that, because residential activities are essentially changing, space-occupying phenomena, defined by their social characteristics, only an approach which identifies all three elements (process, form and function) can tell the whole story. It has also been suggested that such an approach is developing. Nevertheless, there remains much scope for improvement in current ideas and methods, and before defining the main ingredients of a model of urban residential structure it seems desirable to examine some of the limitations of the evolving form-function-process approach as it stands at present.

Chapin defines four criteria of adequacy for urban theory which are pertinent here. Firstly, Chapin (1964, 51) contends, "a theory must have a dynamic aspect if it is to have utility in representing the processes by which cities are structured and by which they grow". The limited description of process seen in the works of Park and of Burgess has already been noted. Burgess, for example, describes the processes by which cities are structured under a very restricted set of implicit conditions. Process must be defined in such a way as to include both the internal dynamics of a particular pattern at one period in time, and also the transition from that period to the next. At the present state of knowledge a simple descriptive stage model seems most likely to provide an acceptable view of process (Eisenstadt, 1964). Changes within each stage of the model would be viewed as the aggregate of individual responses to a set of fixed governing conditions, while change between stages would be seen to stem directly from changes in their governing conditions. Hence urban residential structure follows a different set of rules for each stage and rules are only fixed in the short term. For example, it might be desirable to adopt Burgess's structural pattern as a particular stage in the overall

model. Burgess's concentric zonal pattern with peripheral high status areas then becomes a special case predicated upon a particular set of circumstances producing the pattern and changes (central expansion, peripheral extension and outward filtering) which he described. These circumstances, not explicitly recognized by Burgess, include rapid population growth in a city with an industrial base, efficient transport, a heterogeneous population, free-market housing conditions, and a value system stressing newness and space. Under other circumstances a different pattern would emerge with its own peculiar dynamics.

It might be argued that an inadequate view of process is unlikely in temporal factor-ecological studies, for the work of McElrath and others, stressing factorial change ensures that all researchers have a clear conception of the different bases of residential segregation in earlier periods. Unfortunately this is not the case: the modern Western factor pattern is taken as the norm, and analyses in underdeveloped countries investigate the degree to which such a pattern has emerged. It is therefore necessary to emphasize the different conditions governing urban residential structure at selected historical periods, and for this purpose a stage model seems ideal. The model would not then be stated bluntly in the terms of modern factor structures; rather a prescribed set of social, economic and other conditions would be described for the period concerned and from these it should be possible (ideally) to deduce the relevant dimensions of differentiation.

Such a stage model would then go a long way towards fulfilling another of Chapin's (1964, 51) demands - that the theory have "an internal logic and consistency". In this respect current ideas are seriously inadequate and the study of urban residential patterns is very far from being able to propound an axiomatized system. Two problems in particular deserve detailed attention. Our view of the emergence of family status as a

separate and independent dimension appears to revolve around the decline in the extended family pattern, its replacement by the nuclear family, and the development of alternative life styles based upon new value orientations. Clearly, in a society where economic activity was largely domestically organized, familist and careerist (or at least materialist) orientations might not be conflicting - success in both being measured in terms of the size of one's extended family, and the number of other employees, servants etc. one was able to support. In this sense a large family and a large successful family business might go hand in hand. Only when the dictates of career and of family were conflicting did the question of choice arise. Yet the exact implications of this for family and household composition remain uncertain. How did family and household composition change as economic and family status diverged? Similar doubts linger around the question of fertility too. How are historical trends in fertility (differentiated by social class) related to the gradual disassociation of socio-economic and family status axes? The whole question of urban population growth, its relation to national trends and its connection with the emergence of "modern" patterns remains obscure. It may be expecting too much of a theory of urban residential structure that it should explain both household composition and population growth trends, but such is the potential significance of these issues within the evolving pattern that the conceptual framework must not exclude them. Little is lost if investigation shows the city was merely one particular location where far larger social processes were played out. But if, as a result of examining household structure and population trends, the city is revealed as initiator of massive social change then the Shevky-Bell view of the links between a city and its containing society may be rejected. Beshers (1967), for example argues that urban centres are origins of the diffusion of low fertility levels based on birth control. Empirical confirmation is furnished by Ford and

De Jong (1963) and by Keyfitz (1953) regarding family size. Both Abu Lughod (1963) and Chung (1970) see urban-rural fertility differences as a function of demographic transition initiated amongst the urban population. The evidence for regarding the city as origin of social change is therefore strong.

Thirdly, Chapin (1964, 51) stresses that the theory "must not be so abstract as to have no relation to reality" but "should seek to represent the phenomena under study as they actually occur or appear to function in reality". Modern factorial ecologies frequently fail in this respect. Instead of having people living in houses and flats of various types and grouped into distinctive areas within the city, we all too often find factor scores on socio-economic, family or ethnic status dimensions inhabiting zones, sectors, or cells composed of census tracts of enumeration districts. It lies beyond the scope of a single analysis to correct this substantially. But it is far easier to develop a framework within which improvements can be made. Such a framework must not be stated in terms of differentiating dimensions, abstract geometrical forms and census variables; rather it must be defined in terms of people, houses, and real space, and defined in such a way that the factor structure which will be derived from a particular set of census variables may be deduced therefrom.

Although a particular analysis may necessarily focus on a restricted number of elements at the expense of all others, this should be done within a context which defines the role of those items ignored in shaping the pattern studied. Too often the spatial arrangement of a particular factor's scores is examined in vacuo to test the concentric or sectoral model without any recognition of the fact that the role of land ownership or of conscious planning is being ignored. Ecology examines inter-relationships between organism and environment, yet factorial ecology ignores the totality of environment and examines only those aspects of the individual's social

environment which may be defined from small area census data. So results appear abstract - meaningless - for the reality of urban residential patterns is perceived in relation to the physical, and particularly the built, environment of the city, while analysis relates solely to census variables. Duncan (1955, 84-5) points out that Shevky and Bell do not treat the relation of 'social areas' to any other kind of area; Beshers (1969, Chapter 6) considers the consequences of spatial distribution for urban social structure; Anderson and Bean (1961) stress the significance of spatial concepts in an understanding of behaviour; and Bell (1958) introduces location relative to broad land use categories to provide important extra information about neighbourhoods. Clearly the physical environment cannot be ignored - particularly when it is claimed that the family status dimension is articulated in terms of a preference for certain types of residential environment. Only by including the physical environment can we approach the reality of high quality housing spaciously laid out on high, well-drained land with good views and of working class terraces crammed next to riverside factories on low-lying, ill-drained land.

Finally, Chapin (1964, 51) stresses that theory must be "capable of being tested". A theory couched in so many provisos and special conditions that it no longer acts as a generalization is no theory. The danger increases when an attempt is made to introduce relief, land ownership, conscious planning etc. to explain form: testing of spatial models becomes impossible if any inconsistency is permitted so long as it can be attributed to one of the recognized distortions. For this reason the present work concentrates on a 'process-function' approach, and only considers form at a later stage.

Urban residential patterns are here seen as a (changing) distribution of space between (changing) social groups. The major process is thus the allocation of space to the members of particular social groups. Allocation

is, however, a neutral term which - it may be argued - does not adequately describe the historical distributive processes which have operated in the city. Park used the term 'competition' and this is perhaps the more useful term for it implies a certain tension which, nevertheless, does not suggest that all 'competitors' are equally fit. Discarding Park's restricted application of 'competition' solely to subsocial processes, we may accept competition for the most favoured and most favourable urban locations as the key feature of the allocation of space between individuals within the various social groups. The distinct stages of our model of urban residential patterns are then governed by different conditions of competition so that changes between stages result from the advent of new conditions of competition. Change within a stage results from individual actions in response to the prevailing competitive situation. For the complete view of residential differentiation advocated here, the conditions prevailing at each stage in the model must be interpreted in terms of form, function and process, allowing prediction of all three facets of residential structure for a particular city during a particular historical period. The factor ecological approach then offers a means of testing the threefold prediction. One problem in applying the model to historical situations is that the conditions obtaining may be imperfectly known, and precise prediction difficult. If the factorial approach is to be used as a hypothesis-testing device there must be enough evidence outside of the data for the analysis, for the conditions of competition to be established. Otherwise refutation of theory would be impossible - any incongruence between theory and empirical reality being attributed to misdefinition of prevailing conditions, rather than to the inadequacy of the theory itself. The conditions governing competition for urban sites must therefore be established from data other than that used in the factorial ecology.

For convenience, the factors governing competition of residential sites within the city may be divided into two types (Figure 2.1). "Conditions

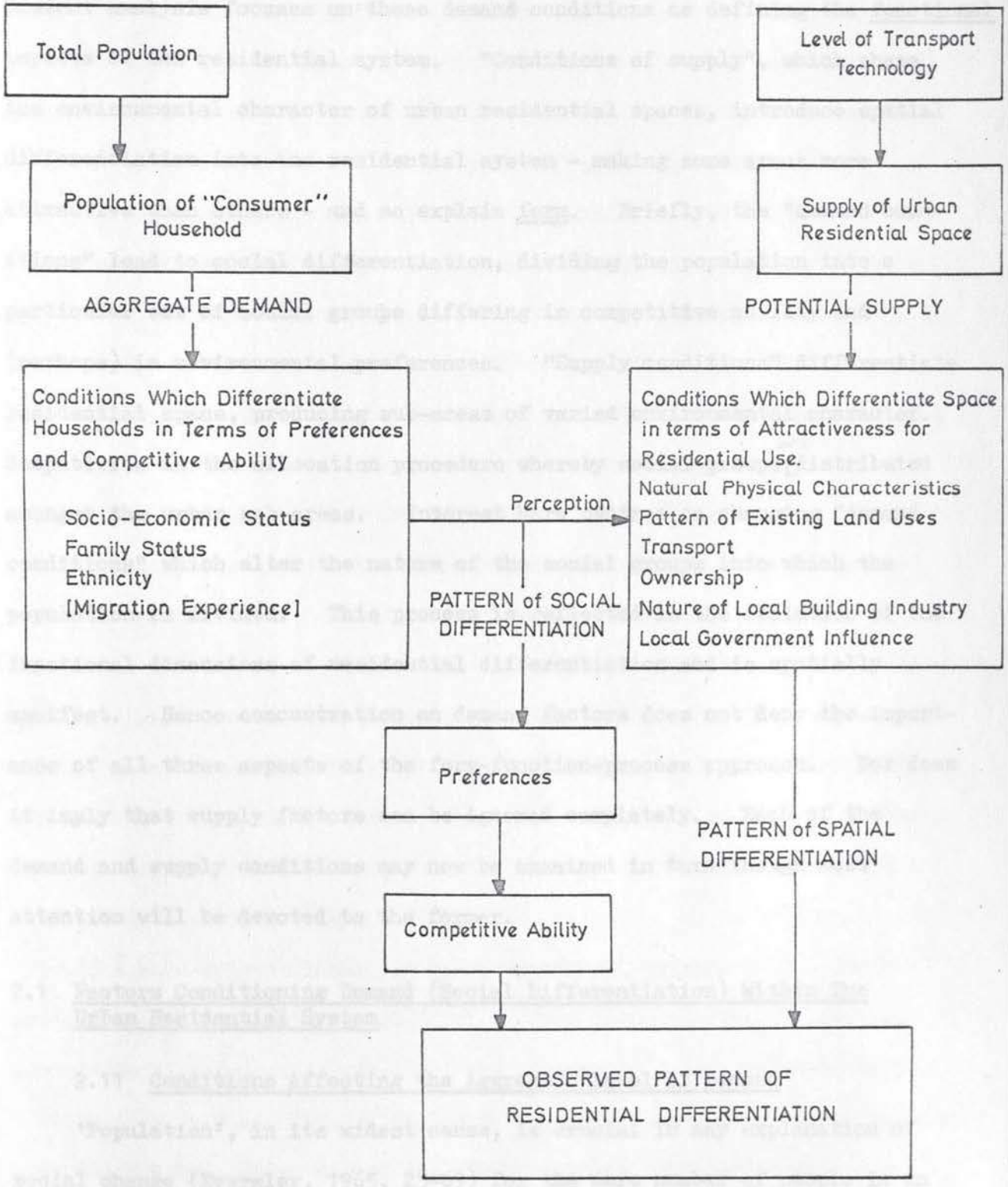


Figure 2.1: Social and Spatial Differentiation: Conditions of Demand and Supply in the Market for Residential Space.

of demand" control the patterns of social differentiation, by differentiating households in terms of competitive ability and spatial preferences. The present analysis focuses on these demand conditions as defining the functional aspects of the residential system. "Conditions of supply", which shape the environmental character of urban residential spaces, introduce spatial differentiation into the residential system - making some areas more attractive than others - and so explain form. Briefly, the "demand conditions" lead to social differentiation, dividing the population into a particular set of social groups differing in competitive ability and (perhaps) in environmental preferences. "Supply conditions" differentiate residential space, producing sub-areas of varied environmental character. Competition is the allocation procedure whereby social groups are distributed amongst the urban sub-areas. Interest here centres on changing "demand conditions" which alter the nature of the social groups into which the population is divided. This process is reflected in the evolution of the functional dimensions of residential differentiation and is spatially manifest. Hence concentration on demand factors does not deny the importance of all three aspects of the form-function-process approach. Nor does it imply that supply factors can be ignored completely. Each of the demand and supply conditions may now be examined in turn though most attention will be devoted to the former.

2.1 Factors Conditioning Demand (Social Differentiation) Within The Urban Residential System

2.11 Conditions Affecting the Aggregate Level of Demand

'Population', in its widest sense, is crucial in any explanation of social change (Eversley, 1965, 23-69) for the mere number of people in an area at a given time profoundly affects the lives they are likely to lead. (Harrison, 1973, 23) Rapkin (1956) shows that house building for replacement is minute compared with that due to population growth, so population

trends are likely to have a profound effect on the residential patterns of town and city. The level of housing demand depends on the rate at which potential households are being formed (Cullingworth, 1960) which, in turn, depends on changes in population and in preferred household composition. If a city's population is rising rapidly due to immigration and/or natural increase, and if the growing population wishes to live in much smaller households, then the level of demand will be very high, and - supply conditions permitting - considerable growth will occur. Growth has a far more important impact on urban residential patterns than is often recognized. "In the absence of growth the conditions of obsolescence, invasion and succession which provide the dynamic to the Burgess model and which ..... make the zone in transition so unattractive to high status populations no longer apply" (Timms, 1971, 222). Schore (1965, 347-98) admits that, given growth, central expansion and transport improvements the upper strata move out and are replaced by the lower classes in the central areas, but does not see this as the final product. Central redevelopment may again make it the desirable prestige area, being then the newest zone. Then, he argues, Burgess's concentric zones and the pre-industrial pattern are both special cases better subsumed under a more general theory of urban residential land use. "Unfortunately such a theory does not exist at this time." (ibid., 374).

If a more general theory is to be developed, treatment of growth - or the level of demand - is essential. This is particularly true when a stage model approach is adopted: any attempt to divide urban history into periods must acknowledge that the rapid population growth accompanying industrial urbanization shaped the city inherited by later stages. The problem is best tackled by linking the stage model with an acceptable view of population growth cycles. Clearly what is required is a general theory linking social change and population growth, and this may be thought

singularly lacking. There have been some attempts to generalize and amongst these the work of Cowgill (1963, reprinted 1970) is especially relevant to the period of industrialization which forms the focus of the present study.

Cowgill claims that the basic assumptions of Malthusian theory may form the foundations of a more general theory which is acceptable even in the light of more recent events and advances in learning (ibid., 627-8). He goes on to present a set of generalizations which admit the Malthusian model as a special case. This approach is particularly valuable since it resembles our own treatment of the Burgess model of urban structure. In their respective fields both the Malthusian view of population growth, and Burgess's view of the evolution of urban structure are very similar and share the common fault of assuming a situation of very rapid growth and change was normal. As Cowgill remarks, "the most common historical condition is not growth, but non growth, or seen at close range, short-term cycles of growth and decline which average out to stability" (ibid., 628). Assuming a stable equilibrium is usual and growth only sporadic, he develops 'transition theory' to describe how society progresses from one equilibrium position to another by a temporary phase of rapid growth. His reformulation of Malthusian postulates "in a form which does no violence to our more sophisticated knowledge" (ibid.) may be summarized as follows.

Any population can and, unless inhibited by environmental factors, will tend to increase at a geometric rate, quickly filling any finite space and taxing resources. As the maximum capacity is approached inhibiting factors will come into play slowing increases, and halting growth if environmental limits cannot be expanded or resources used more efficiently. At any given time most species have long passed their maximum growth rates reaching an equilibrium with a relatively stationary population. For man, too, the most common condition is population stability, but his unique

capacity for innovation occasionally produces technological breakthroughs permitting more efficient use of environmental resources in any specific area. This raises the potential carrying capacity and, given the persistent tendency of population to increase, tends to trigger a population growth cycle.

His 'transition theory', which deals with two conditions of stability and one of change, regards the modern growth cycle as a transition from stage 1 with high uncontrolled birth and death rates, through stage 2 - the period of growth - to stage 3 with low controlled birth and death rates. The transition theory is developed at length, but briefly suggests that with no effective birth and death control technology population rises to the maximum environmental carrying capacity reaching a stable equilibrium with high birth and death rates and limited longevity. Under conditions of industrialization and urbanization the developing technology of death control tends to be applied earlier and more widely than that of birth control causing rapid population growth and extensive structural changes in the population. Later, if cultural values permit, birth control reduces growth producing a new equilibrium. The nuclear family tends to replace extended forms and, as birth rate falls, so does the size of the nuclear family. The technology of death control is applied first and most extensively in the upper classes; only later is it applied with equal vigour in the lower classes. So while death rates are falling there are marked class differentials. Similarly birth control is applied first and most extensively in the upper classes (Abu Lughod, 1965) producing marked class fertility differentials. Birth rates fall first in cities, and only later in rural areas. Finally, Caplow describes the implications with respect to population structure. A population with high uncontrolled birth and death rates is young, dominantly male, concentrated in rural agrarian and extractive occupations. As birth and death rates fall the population ages,

and an ageing population tends to be predominantly female. During demographic transition there is a marked shift from extractive and agrarian to industrial and commercial occupations, and an urbanization of the population.

Integrating such generalizations with others regarding urban residential structure is not easy, but certain similarities are undeniable. Both stress the extraordinary amount and significance of change during industrialization and modernization. Further, both sets of generalizations have a prominent place for class fertility and mortality differentials raising the possibility of a link between changing population growth rates and the dissociation of family and social status axes. Certainly the ageing of the upper status groups as their birth rates begin to fall might suggest an initial link between social status and the life cycle element of family status so that rapid dissociation of the two dimensions is unlikely.

Of similar significance, and also related to questions of growth, is the issue of city size: a massive literature suggests that patterns of residential differentiation vary with town size. Most differences stem from variations in supply conditions, however, and discussion is delayed until Section 2.2. Moreover, in examining the factors conditioning the demand for urban residential space we are not principally concerned with the absolute level of demand - for urban patterns are not merely a question of numbers. Houses, and the areas in which they be, cannot be considered an undifferentiated 'product', nor can households be regarded as a homogeneous group of 'consumers' with identical needs and tastes. Factors which differentiate consumer households in terms of competitive ability and of preferences are crucial to the development of residential neighbourhoods with a specific social character. Conditions which differentiate 'consumers' must therefore be examined in detail.

2.12 Conditions Which Differentiate Households

Historically, status has always differentiated households in terms of their preferences, competitive ability and actual consumption of residential space. Those of higher status invariably occupied a pre-emptive position so examination of a society's stratification system should allow us to define the status groups that will be competing for the most favoured and most favourable urban locations. The precise requirements and preferences of each household in terms of house space and environmental quality is another differentiation factor and if, as is claimed, the structure of a society's productive activity defines groups of households where housing needs differ, then analysis of the structure of productive activity should suggest how far particular types of household demand housing of a specific sort and/or of particular environmental character. Finally, factors such as religion, race ethnic origin and migration experience have traditionally led to a spatial clustering of distinctive minorities within the city. Minorities are often underpriviledged having poor access to opportunities, both because of their lack of familiarity with the local opportunity structure and because of discrimination against them. But a minority group may merely form the lowest stratum of the status ranking system, and so demand no separate recognition. Only when there are particular reasons for the spatial concentration of minorities within urban residential space will the existence of minority groups define another facet of the differentiation of households in respect of their consumption of that space. Households may therefore be differentiated in terms of their status, as defined by the structure of the social stratification system, their housing and environmental requirements, as defined by the structure of productive activity, and by their group affiliation, as defined by the minority elements present in the population.

Returning now to the stage model of urban residential structure, if urban societies from different stages of the model vary in the dimensions

of residential differentiation obtaining then they must also differ with respect to their systems of social stratification, the structure of their economic activities and the prevalence of minorities in the population. Households, we have argued, may differ in three ways. Unless cities from successive model stages vary with respect to the structures defining these differences between households there should be no change in the (functional) groups competing for residential space. Each of the three structures may now be examined in turn.

2.13 The Structure of the Social Stratification System

The urban residential pattern of a city in which a small elite dominates a large, homogeneous majority is unlikely to resemble that of a city whose population is divided into very many different status levels. The former, containing only two 'functional' groups, may be taken to represent the feudal situation in which a small group exercises an absolute pre-emptive right, and is also responsible for organizing the residential disposition of the large non-elite population. The latter resembles the modern position with small groups at successive status levels exercising a pre-emptive right over those of lower status. Marxist predictions (summarized by Dahrendorf, 1959, 9-18) that the middle class would disappear and the upper occupational groups decrease in size have proved ill-founded. Modern industrial societies are characterized by "a growing middle class ...", " ... an increasing wealth of the proletariat ..." and a "relatively high percentage of non manual occupations in the labour forces ..." compared with their pre-industrial past (Soares, 1967, 192). Intermediate occupational strata tend to grow faster than lower ones in a modern industrial society for technological advance raises labour productivity, freeing a growing proportion from manual jobs. "This growing middle class is qualitatively new; it is internally more differentiated than the old middle class because it has a different occupational composition" (ibid., 193).

Compared with traditional agrarian populations, most members of modern society work in manufacturing, mechanical pursuits, trade, commerce and other non-agricultural occupations characterized by a high degree of specialization and of dependence on the work of other specialists. Davis and Moore (1945) suggest that differentials in the functional importance and in the scarcity of personnel for a job define its position in the stratification system. Hence the development of a multi-level stratification system is linked with economic progress and parallel increases in the division of labour (Faunce and Clelland, 1966). Clark (1953) sees the most important concomitant of economic development as the shift of the working population from agriculture to manufacturing, and thence to commerce and services.

The expansion of manufacturing employment relied upon increased agricultural productivity, freeing men from food production. Technological advance in a profit-seeking situation encouraged the concentration of manufacturing in factories which employed many men and so permitted complex specialization and division of labour. This growing industrial employment was largely, though not exclusively, manual and therefore "working class" but, by establishing a wide variety of skilled specialists of differing levels of ability, it increased the stratification of the occupational system. Following this expansion of manufacturing employment there was an increase in tertiary and largely non-manual (white collar) occupations providing further opportunity for individual specialization. Such an intensive division of labour increases stratification so minimizing class distinctions and reducing the elite's power. But if a two-stage view of growing stratification is at all valid, if an initial occupational specialization amongst an expanding manufacturing population was broadly followed by an expansion and increasing differentiation of those in tertiary employment, then we cannot suggest that suddenly, as a result of the Industrial

Revolution, society was immediately and irreversibly transformed. The process was, rather, one of gradual evolution from a less stratified towards a more stratified social structure.

In fact there is evidence to support this evolutionary view of the changes in social stratification. Soares, for example, suggests significant changes in the relative sizes of working and middle class groups as industrial societies progressed towards maturity. In nineteenth century Europe working class employment expanded rapidly, but the middle class did not increase significantly in size until the beginning of the twentieth century (though slightly earlier in England). "This was due to the fact that urbanization was slow and the relative size of the middle class, which is predominantly urban, had its growth limited by the speed of the urbanization process" (Soares, 1967, 196).

2.14 The Structure of Economic Activity

There is clearly a close link between the development of occupational specialization and the intensification of social stratification on the one hand, and the separation of home and workplace which, it is held, transformed family, on the other. Both result from technological advance and the increased scale of economic organization. But the precise link between separation of home and workplace, and the development of an independent family status dimension is far more obscure that the link between factories, specialization and stratification.

Before the Industrial Revolution the extended family was the esteemed form. With economic activity domestically organized and with employment of family members in the family business there was probably no conflict between family interests and business interests. People operated within what Durkhiem called the 'natal milieu' in which an individual's position depended upon ascribed or inherited qualities, and the family formed the basis of status ascription. Such a system is not ideally compatible with

industrialization. In industrial society performance or achievement are important, and hence a person must be permitted to rise or fall, and to move where-ever job opportunities dictate. Land ownership also becomes less important and so mobility is encouraged. But the extended family form restricts mobility. Few industrial workers have traditional occupations into which they 'grew', the family group rarely has any direct link with the wage-earner's job, and home and workplace are separate spheres. There is therefore no positive advantage in the extended family form once large scale factory production replaces domestic organization of economic activity, and there are many possible advantages. The conjugal or nuclear family consequently increases in importance, and as industrializing societies create specialist agencies to perform functions formerly handled by extended families (care of the old, etc.) the latter decline still further.

Once the nuclear family has become dominant important characteristics emerge. Because a man's parents and his children no longer live together with him "under one roof", the family develops a life cycle. The initial situation of two young marrieds without children is followed in turn by a middle aged couple with children, and an ageing couple whose children have left home. Household composition therefore follows this life-cycle pattern, and residential differentiation emerges if particular stages in the life cycle are acted out in different locations. But the implications of the separation of home and workplace for family and household composition do not end there. Division of labour and particularly the growth of tertiary employment increases the opportunities of employment for women outside the house. This produces a new element of choice in respect of life style orientations, between 'familist' and (for example) 'careerist' orientations (Bell, 1958 and 1968; Leslie and Richardson, 1961). Though the nuclear family is more mobile than the extended family, the childless

couple or the single individual are more mobile than either, so that the interests of family and of business are - to some extent - conflicting. Similarly, other possible orientations, such as 'consumption', are not wholly compatible with a large family. Contraception develops, freeing women from continual childbearing and so allowing individual couples to choose the life style they prefer. Families are differentiated in terms of the amount of accommodation they require and the environmental circumstances they prefer, by the presence and number of children. Residential differentiation by life style orientation emerges, and may frequently follow a life cycle pattern with single individuals and childless couples pursuing career and consumption, or at least residing in areas characteristic thereof, until the arrival of children leads them to modify these goals.

Goode (1964) extends the argument further suggesting that important characteristics of the conjugal family serve the needs of industrialism. "The couple need not obey anyone outside the family unit, since only their performance on the job is relevant for their advancement. They need not even rely on family elders for job instruction, since schools, the factory ..... or (the) mine will teach them new skills. ..... Thus industrialization is likely to undermine gradually the traditional systems of family control and exchange. ..... The conjugal emphasis on emotionality within the family also serves ..... the needs of industrialism. At lower job levels, the worker experiences little intrinsic job satisfaction; at higher levels, he obtains more job satisfaction, but is also subject to rather great demands. At any level, the enterprise has no responsibility for the emotional input-output balance of the individual; this is solely the responsibility of the family ..... there is nowhere else for it to go. The small family, then, deals with a problem which the industrial system cannot handle" (ibid., 109).

The important aspect of Goode's work is his emphasis on the gradual nature of the changes in family type, for family and industrial factors

"..... are independent but interacting" (ibid., 110). Of the idea that industrialization undermined extended kinship systems, Moore (1965, 86) writes, "This generalization is valid only if the type, degree, and speed of change are subject to question, and it is not assumed that the familial transformation is global and immediate." As was the case with the intensification of social stratification, there is good reason for suggesting that the emergence of an independent family status dimension may have been a case of gradual evolution, and not of cataclysmic revolution.

Certain other rather serious problems regarding the treatment of the family status dimension are examined in depth in Chapter 5. For present purposes it is sufficient to conclude that households are differentiated in the amount of housing space they need and in the preferred type of residential environment. At its crudest the distinction is between single persons in bed-sitters without gardens but close to the city centre, and married couples with several children occupying spacious houses with large gardens near to the countryside. At a less extreme level the population of a thirty year old council estate is likely to be older than that of a three year old estate for both were initially filled with young couples and their children. Life cycle and family composition distinguish the two groups, who consequently differ in housing requirements and environmental preferences. Different groups have always achieved different environmental standards. In traditional economies with extended family patterns and domestic organization of economic activity such differences tended to reflect variations in social status. In economies organized on a larger scale the nuclear family has asserted itself and differences depend upon life style preferences and life-cycle stage. The changing structure of economic activity summarizes the way in which housing needs and environmental preferences differentiate a population.

2.15 The Prevalence of Minorities in the Population

The final condition which differentiates households in terms of their consumption of urban residential space is their minority group membership. Though racial and ethnic differences are most important and therefore most often recognized (Shevky and Bell, 1955) other types of minority group may be significant. McElrath (1968) suggests that migration experience forms the basis for recognizing a 'migrant' minority group, and Jones (1960) indicates the importance of religious differences in Belfast. If minority groups with differential consumption of urban residential space do exist in a city the residential structure will be considerably affected. At opposite extremes we might consider Chicago as described by Park (reprint, 1952) and Rome as described by McElrath (1962). Whereas Park was able to describe a process of racial invasion and succession as one immigrant ethnic group replaced its predecessor in a particular part of the city, McElrath found ethnicity was not an important dimension of differentiation in Rome because of the population's ethnic homogeneity. While religious and other types of minority group may be important in individual cases, the present discussion is pursued in terms of ethnic and migrant minorities because they form one of the more important bases for residential differentiation by minority group status and is the only one for which information is available in the nineteenth century Enumerators Returns. The problem may be divided into two parts: ethnic minorities, and migrant minorities.

Racial and ethnic minority groups often hold a disadvantaged position within the host society, yet their residential distribution is often inexplicable solely in terms of low socio-economic status, being highly concentrated in particular low status areas - and even spreading into part of a better residential zone, but without losing the highly localized distribution pattern. This "ghetto" form (Morrill, 1965) is a function of the migration process itself and of the pressures upon the new arrivals to a city.

As economic growth gets under way and industrialization leads to increased specialization of product so cities begin to draw labour from an increasingly wide sphere. Indeed one of the differences between towns and peasant villages according to Redfield's (1941) folk-urban continuum was that the population of the former tends to be more racially heterogeneous. But migration is not mere mechanical resorting as crude economic 'push-pull' models imply. The Macdonalds (1964), for example, emphasize the role of chain migration in explaining the clustering of fellow townsmen from Southern Italy in North American cities, forming Little Italies, and "chain occupations" - particular niches in the U.S. employment structure to which successive immigrants directed their recently arrived fellows on the basis of their own experience. Chain migration was the process whereby immigrants in the U.S. provided a "feedback" of information and assistance to prospective emigrants in their home towns. Bogue (1959) makes a similar point. We may expect that the need for accommodation and assistance amongst new arrivals will automatically lead them to seek out members of their own ethnic group. "Clustering and co-residence obviously eased the migrant over the culture shock ....." (Anderson, 1971, 155). "It is difficult to be a minority as a group, but more difficult still to be a minority alone. Consequently the desire to escape the ghetto and move freely in the larger society is tempered by a realization of the problems in store for the 'pioneer' and hesitancy to cut neighbourhood ties with his own kind. ..... In most cities, even if there were no housing discrimination, the ghetto would still persist ....." (Morrill, 1965, reprint, 1969, 263). As the Macdonalds point out (Macdonald, 1964) clustering and chain migration are particularly likely if the social forms of the contributing society include a multi-lateral kinship system and dyadic patronage - as was the case in Southern Italy. But chain migration based on a hometown society of this type is precarious, and may leave some

prospective emigrants out on a limb if a potential sponsor abroad deserts his family, friends and clients upon assimilation to his host society, or if he rejects all obligations but those to close relatives.

In the long run, however, the pattern must be expected to change. Duncan and Lieberson (1959) analysed ethnic segregation and assimilation in the light of two hypotheses. (a) The degree of residential segregation of a group of foreign stock at any given time is inversely related to appropriate indicators of its socio-economic status and degree of assimilation and directly related to indicators of its "social distance" from the population of native stock. (b) Ethnic segregation patterns are relatively stable over time but change in directions to be anticipated on the basis of the positive correlation between assimilation and length of time that the immigrant group has been established. Their analysis of Chicago's ethnic segregation revealed a decline from 1930 to 1950 in the segregation of foreign born whites from the "new" countries with respect to the native white population, though foreign born whites from "new" countries remained much more segregated than those from "old" ones. Centralization also declined, following the classic hypothesis that immigrants tend to locate near the city centre and, in time disperse towards the periphery until they are no more assimilated than the native population. Duncan and Lieberson saw ethnic differentials in socio-economic status as indicating incomplete absorption and assimilation. Myers (1950) drew similar conclusions from a review of the progress towards assimilation of Italians in New Haven, in which he examined their distribution in the city, their occupations and their political posts. He concluded that the amount of mobility into an occupational group or political level had been (generally) proportional to its status, with residential dispersion forming part of the minority's incorporation into the dominant social system. On achieving financial success many Italians tried to

climb into upper class society, and to do so had to live in the right neighbourhood: hence a mayor or famous doctor moved up the neighbourhood hierarchy to the top. Upward mobility was limited by higher rent, pressure from within applied by the residents of the old neighbourhood, and from without by those of the prospective new one. Italians were despised for living in slums, but aroused resentment in better neighbourhoods: former friends often ostracized the "upstart".

Often ethnic minorities are concentrated in the city's worst housing in conditions of serious overcrowding. This results from the low economic competence of immigrants (though Philadelphia's Russians (Beshers et al., 1964) and New York's Norwegians (Jonassen, 1949) are highly concentrated yet enjoy a higher social status than the native population), their desire to live amongst compatriots, and the prejudice of the host community. Even so the degree of segregation may be expected to decline as assimilation proceeds and the social status of the immigrant group begins to rise so that it more nearly resembles the native population.

Migrant minorities differ from ethnic and racial minorities largely in the absence of major cultural, linguistic and physical characteristics which distinguish them from the native population. Beshers and Nishiura (1961) see the differential characteristics of internal migration streams as consequences of social and cultural constraints upon the household head, whose job determines the move for the whole family. Both 'purposive-rational' orientations (characteristic of the professional whose life is organized in terms of long range goals as he has spent years attaining advanced education or training) and 'short-run hedonistic' orientations (typical of rural migrants with little education) are considered. Ten hypotheses are proposed, stressing the greater mobility of the better educated, managerial and professional categories, and the importance in rural migration streams of those aged 20-24. Zimmer (1955) claims that

data on membership of formal organizations, officership, and on registration to vote in local politics, support two hypotheses. (a) Migrants differ from natives in the level of participation but become more like natives in behaviour the longer they live in a community (so that re-migration again limits participation). (b) Urban migrants tend to enter community activities faster than farm migrants. Adjustment takes over five years and low status migrants may never attain the same level of participation as natives in certain fields. High status facilitates adjustment, and farm migrants have the slowest entrance rates.

Clearly, migrant and particularly ethnic or racial minorities tend to be spatially clustered within the city. Indeed Freedman (1963) suggests that a 'migrant zone' forms a distinctive, heterogeneous part of the urban ecological pattern, being characterized by high social disorganization. He further states that, in the American city, the Negro's colour is more important than his origin in determining his social characteristics, and his colour is more important than his social characteristics in determining his areal segregation. Except for Negroes and rural farm migrants, migrants tended to be young, well educated, concentrated in service-production occupations, they tended to live in small families or alone, and were high in numbers of males. These patterns suggest the types of relationship which may be found in any town where ethnic or migrant status form a significant axis of residential segregation.

2.16 Summary: Conditions which Differentiate Households

Households within a given society are differentiated by their status, their composition and consequent housing and environmental needs, and the minority or majority group members; all three factors influence the individual household's consumption of urban residential space in terms of quantity and location. Different societies are differentiated by the systems they contain for defining status, household composition and

minority group membership, and in the degree of interrelationship between these three systems. Timms (1971, 143-4) states the case succinctly.

> "In pre-modern society there is a high degree of coalescence between the criteria of social differentiation: an individual's status in one institutional realm is highly predictive to his standing in others. Status is ascribed and differences in prestige, way of life, ethnic identity and place of residence are intimately related. With modernization this coalescence breaks down. An individual's kinship connections no longer provide an almost perfect basis for predicting his social rank, his place of residence, or, even, his ethnicity. The modernization of society causes a progressive differentiation in status-systems: new bases of differentiation appear and there is a progressive weakening of the traditional links between categories. The modernization of the individual, his social mobilization or psychic mobility, provides the dynamic which translates social change into the emerging axes of social - and thence residential - differentiation."

The expectation of Berry and Rees (1968, 491) that "differing urban ecologies relating to differing factor combination can be arranged along a scale of urban development from pre- to post-industrial forms" must, as they stress, be systematically tested. It is argued here, however, that differing factor combinations alone do not adequately represent the urban residential system, for although variations in factor patterns may describe functional and evolutionary elements they are aspatial. Only by examining form too can the system be treated as a whole. Consumer preferences for particular urban locations at the expense of alternatives are clearly very important in any explanation of spatial form. Such preferences provide the link between differentiated groups of household and physical space within the city. Together with competitive ability and the level of demand, preferences help define the urban residential pattern. Because preferences are culturally defined, and may be subject to wide temporal variation they are best treated separately from the factors which differentiate households <u>even though</u> differentiation is in terms of preferences as well as the ability to compete in the urban residential market.

2.17 Conditions Which Influence Household Preferences

Environmental preferences provide the link between the various groups into which society is divided and the different sub-areas of the city. Together with competitive ability, preferences control the allocation of social groups to residential neighbourhoods. Preferences therefore mediate between social and spatial differentiation and help determine urban 'form' as far as residential distributions are concerned. As Hollingshead (1947) stresses, cultural values and usages are tools which regulate the competitive process. (Chapin, 1968 and Johnston, 1972 make related points.) Nowhere in the description of modern society as more stratified, less rigidly structured ..... etc. is there an explanation of the shift from the pre-industrial pattern with high status areas centrally located.

To link social and spatial changes we must posit a change in "consumer" preference regarding location - perhaps a new set of values stressing openness and space. Preferences do not operate *in vacuo* nor do they change perversely without reason. A key role may have been played by environmental and economic changes making the centre less attractive and more expensive, but unless a change in preferences also occurred there is no reason for a flight to increasingly distant suburbs. Changing social structures are clearly relevant here, for the declining degree of coalescence between the criteria of social differentiation has been paralleled by the emergence of different locational preferences reflecting the divergent needs of the new "consumer" groups. The change is apparently summarized in many of the rural-urban dichotomy models (discussed in Mann, 1965). Durkhiem (1974), for example, distinguished between man in nature (or mechanical solidarity) and man in society (organic solidarity). Mechanical solidarity bound the individual to society with no intermediary, making society a more or less organized totality of beliefs and sentiments common to all group members.

Organic solidarity, by contrast, bound the individual to society through his dependence upon its component parts making society a system of different, special functions which definite relations unite. This idea is consistent with the general view of social change presented earlier, and is particularly relevant in considering the development of diverse value orientations and locational preferences. In the pre-industrial city mechanical solidarity predominated and there was a common orientation toward both the extended family and residence in the city centre; households were differentiated, by status, in the extent to which they could achieve these goals - their degree of success on one being highly predictive of that on the other. In the modern city organic solidarity is dominant, the consensus has disappeared and households with careerist orientations may prefer city centre residence whilst those with familist leanings prefer suburban locations; there is greater specialization with particular family patterns - and associated residential sites - being associated with specific stages in the life cycle. Interestingly enough Durkhiem's theory was originally stated in such an evolutionary context suggesting that with advances in the scale of social evolution mechanical solidarity weakened. In societies where organic solidarity predominated, he said, individuals were no longer grouped according to their relations of lineage, but according to the particular nature of the social activity to which they devoted their efforts. This replacement of the 'natal milieu' where a person's position depended on ascribed or inherited qualities, by the 'occupational milieu' where his position depended upon achievement, performance and function (Durkhiem, 1947, 200-20; see also Parsons and Shils, 1951; Lipset, 1967, 161), can be translated into spatial terms. In the pre-industrial city a person of low status, born in the urban periphery, would have little chance to rise socially and would therefore remain in a similar location spatially. In the modern city a person of low status, born in a slum near the city centre, might rise socially and

move to a high status residential zone; he might adopt careerist orientation and so live near the city centre, or a familist orientation and live in the suburbs.

It seems desirable to state exactly what spatial preferences have existed. The medieval city is sometimes held to have been divided "into precincts, based on vocation and interest ....." (Mumford, 1966, 357), with perhaps "a clerical precinct, a royal precinct, and a merchant's precinct, corresponding ..... to the chief vocations, while craftsmen and peasants must have occupied the rest of the town. To this constellation, university towns ..... would also add their college precincts, each relatively self-contained." (ibid.) Besides being organized into functional precincts, the medieval city was - according to Mumford - integrated into primary residential units, composed of families and neighbours. "In a sense, the medieval city was a congeries of little cities, each with a certain degree of autonomy and self-sufficiency, each formed so naturally out of common needs and purposes that it only enriched and supplemented the whole. The division of the town into quarters, each with its church or churches, often with a local provision market, always with its own local water supply ..... was a characteristic feature; but as the town grew, the quarters might become sixths, or even smaller fractions of the whole, without dissolving into the mass" (ibid., 356-7).

Similarly Vance (1971) believed that the 'pre-capitalist' city was a patchwork of occupational zones located by "accident rather than by rent-paying ability" (ibid., 105). Medieval urban life was, he claims, "popular rather than patrician" (ibid., 101) with guilds - as instruments of access to participation in civic life - "among the most powerful forces shaping the morphology of the medieval town" (ibid., 105). Because "a man used rather than possessed land, his valuation of it was a functional rather than a capitalist one. In such a context, locations were not

relative, but absolute; to exist within a gild area was necessary for the proper practice to a trade and for the receipt of the social benificence of the organization. In a true sense the value of land in the Middle Ages was the value of social association" (ibid., 103) and so the individual lived near to other members of the same guild in domestically organized households clustered into the functional (occupational) precinct.

The opposite view is taken by Sjoberg who believes that, in the pre-industrial city, "the elite typically has resided in or near the centre, with the lower class and outcast groups fanning out toward the periphery" (Sjoberg, 1965, 216). The elite was attracted to the city centre, not by business functions, but by non-economic activities, whether political, administrative, religious or educational. "Assuming that upper-class persons strive to maintain their prerogatives in the community and society ..... they must isolate themselves from the non-elite and be centrally located to ensure ready access to the headquarters of the governmental, religious, and educational organizations. The highly valued residence, then, is where fullest advantage may be taken of the city's strategic facilities; in turn these latter have come to be tightly bunched for the convenience of the elite" (Sjoberg, 1960, 88-9).

Whatever the truth of the matter regarding the medieval city, and even if we accept many of the elements suggested by Vance and Mumford, then change came before industrialization. "As the old order died, so did its symbols, and with the rise of a new society, so new dominants appeared. The monumental road, the buildings of commerce and power, the princely churches and, above all, the palaces, show us that the world of Hans Sachs had vanished to be replaced by a new one, to culminate in that of Le Roi Soleil" (Curl, 1972, 87). Of the baroque town Mumford (1966, 424) writes "In the medieval town the upper ..... and ..... lower classes had jostled together on the street ..... Now, with the development of the wide

avenue, the dissociation of the upper and the lower classes achieves form in the city itself." Certainly, before the modern city emerged, there evolved a city plan based often on commerce and civic pride, and occasionally on royal patronage, which gave the elite a central location. Often the "elite" of smaller towns were merely the better-off traders of the town and a few local dignitaries, but they lived in - or very near to - the city centre; since they ran domestically organized businesses they had little option but to live in the centre while transport facilities were so poor. Anyway the centre was the best part of the town, with some possibility of proper sewers and piped water, paving and lighting.

But the situation began to change as the city grew. The concentration of population made central sites very valuable while they became less environmentally attractive for residential use. (cf. Alonso, 1964, describing a structural theory of urban form which represents the working out of tastes and incomes in the market.) The growing importance of alternatives to residential uses in the centre encouraged families to leave. Transport improvements permitting commuting made this easier. But there was no reason why the high status population should, on leaving the city centre rush for the suburban fringe - and there is room for debate as to whether this did in fact happen. Burgess's model, as was pointed out in Chapter 1 seems to suggest a continual increase of socio-economic status away from the city centre. Now we could claim that urbanization had made the urban area so undesirable for residential purposes that the high status groups rushed for open countryside, where they could build themselves new houses in a more open rural style and as unlike the city centre business premises as possible (see Guest, 1972, 385 for a parallel view). But Burgess's 'commuter zone' is described as the domain of matricentric families and is occupied by those who can afford it and who prize suburban life. Since such a 'space-preference' is normally associated with familist

orientations, Burgess implies both increasing socio-economic status and more familist value systems outward from the centre. Johnston (1971a, 68) suggests that, since social and family status axes only slowly become independent with continuing economic development, they may have still been highly correlated in the Chicago of the 1920s. Indeed Shevky and Bell found a correlation between their two sets of indicants but ignored it (see Beucheley, 1956). If only the richest people were able to afford to travel in to work from some distance (Guest, 1972) then it was only amongst that group that any difference between individual value systems could find spatial expression. The poor working man with a big family could not move to the suburbs as a better place to raise children for he could not afford to travel to work and could not find suburban employment. Changing supply conditions allowed most people, regardless of income, to choose between suburban and central residence producing the association between familism and the suburbs as noted by Anderson and Egeland (1961), Berry (1965), Murdie (1969) and Bell (1968, but see also 1958).

As to the observed sectoral arrangement of socio-economic status (Section 1.42), Hoyt's belief in the fundamental importance of the location of high status housing and his conviction that such high rent areas migrate outwards along radial transport routes from their origin at the edge of the C.B.D., now make sense. A high status group centrally located and convinced by force of economic argument that their residence could be more profitably used wholly for business, would be located as near to their business as possible - only avowedly familist orientations would lead them to the suburban fringe if there were alternatives nearer at hand. Nevertheless we cannot use this process to support the argument that no change in preferences has occurred, and that the value of commercial uses has merely outbid the high status population in securing central sites. The new element is provided by a value system which stresses newness and

which emphasizes the position of the elite by their occupation of an exclusive residential area. Firey (1945) has argued that the prestige of an area, its sentimental and symbolic meaning, may reduce or completely check the effect of ageing of fabric and the encroachment of other uses. More usually, however, the environmental attractiveness of a particular area declines as the fabric ages and so the high status group moves elsewhere. Changing locational preferences are thus apparent even within the orbit of high status groups. When the emergence of a separate family status axis, with new and distinctive preferences, is admitted the role of preferences in shaping urban residential structure is unmistakeable.

2.18 Conclusion: Factors Conditioning Demand Within the Urban Residential System

It has been argued that urban residential structures at various stages in history have differed considerably, and that these differences have stemmed from differences between the "consumers", their preferences, and the level of their demand with respect to urban residential space. The patterns of residential differentiation may be predicted for any city at any period given information regarding the social structures which define the various "consumer" groups, together with data reflecting spatial preferences and population changes. Modern societies appear to differ from their traditional predecessors in the greater number of "consumer" groups of household types, the greater variety of spatial preferences, and the low, stable vital rates. No longer can households be arranged along a single axis reflecting status, family composition and possibly ethnicity too and highly predictive of location. The nuclear family having replaced multigenerational extended forms, households may vary in their composition (reflecting their stage in the life cycle) irrespective of their social status, and to some extent ethnicity is also another separate axis. Together, however, a consideration of the conditions which differentiate households within a particular urban society, the preferences of

the respective groups, and the general population trends provides a substantial basis for predicting the formal, functional and evolutionary aspects of urban residential patterns at almost any historical stage.

Though the present work focusses upon the factors conditioning demand within the urban residential system an understanding of the "supply" conditions which differentiate urban space is useful in suggesting the context within which "demand" conditions operate.

2.2 Factors Conditioning Supply Within The Urban Residential System

It might be argued that many of the factors examined here affect the demand for particular urban sites and so do not constitute conditions governing the supply of urban residential space. Though the point is valid, it is preferred to group together those factors which produce a differentiated supply of residential property, and in this sense the label "supply conditions" is not wholly appropriate. Since the factors conditioning the supply of residential space in the city are numerous (Brown, 1972; Form, 1954) six have been selected as particularly relevant in a nineteenth century context. These are listed in Figure 2.1 in the order followed here. Where possible, evidence regarding the nineteenth century city is cited to suggest typical Victorian environmental preferences.

2.21 Natural Physical Characteristics

Natural physical factors have a considerable influence on the spatial form of the residential system - making some areas more attractive than others (Brigham, 1971). High rent areas seem to be drawn towards high ground free from flood risk and with fine views (Hoyt, 1939, 116-7); the natural environment defines limited areas as most suited to high status development, producing a restricted supply of naturally attractive sites. Relief was even more significant in the nineteenth century owing to the poor standards of sewers and drainage. In nineteenth century Nottingham, "Housing developments along the western elevated side of the town were

distinctly superior to those on the lower-lying north, east and south sides. Building and garden plots were larger, the plan more open" (Straw, 1967, 138). High status housing in Mansfield was "..... on rising ground clear of the poorer property ....." (Jennings, 1966, 96). Working on Bradford, Mortimore (1960, 154-5) comments, "By 1822 the preference of the wealthy for higher ground which has been so common in English towns was manifesting itself in the outward extension of the north-western part of the old town as the best residential district, ... on a lower level there were ..... substantial working class areas ....." Similarly, of Leeds in the late eighteenth century, Ward (1960, 57-8) states that, "In a town with substantial topographic diversity the distinction of the high and low areas, especially at a time of ill-developed drainage, came to have important social implications. The high and low areas of the town ..... provided the material advantages which conditioned the process of residential segregation."

The unhealthiness of low-lying and ill-drained working class areas is commonplace. Armstrong (1967, 137) uses data for York 1839-41 to show clear differences by ward in death rates from epidemic and pulmonary diseases. The worst figures were not in the most overcrowded district but in that with the lowest drainage altitude. A clear link between high mortality, poor drainage, low class and income is demonstrated. The smoke of factories and houses contributed to the insalubrious character of low lying areas, and windy eminences were often preferred. "Woodhouse Lane, St. James' Street and Sunny Bank were commended for their site and elevation, the air was remarkably salutary and bracing from which circumstance it was preferred by invalids to any parts of the town" (Ward, 1960, 71).

The linear development of Welsh mining valleys shows the way relief may restrict the supply of residential space; if, in extreme cases, all

zonal and sectoral patterns disappear, the influence of the natural physical environment in less accidented areas must not be underestimated. The effect of topography is often felt through development costs (Brigham, 1971), and since the economics of development varies both with technology and with prevailing land values, 'problem' areas may be developed later than neighbouring parts of the city of developed in different ways. This may be important. If hilly land were developed early whilst its accessibility to the city was poor, the maximum residential density which would be economic would be low. But if development were delayed until accessibility was good, far greater densities (requiring more costly grading) would be feasible given the greater value of completed housing there (ibid., 166). Hence, because of its natural characteristics, the date at which an area was developed might influence its residential attractiveness for a very long time thereafter. Steep gradients and poor drainage may delay development, but the most lasting effects are often those of the land use patterns which eventually emerge. The location, in the nineteenth century, of an industrial belt along a valley-bottom canal may have more effect upon the location of other land uses today than does the physical form of the valley itself. For this reason, the pattern of existing land uses may provide a summary of the more significant influences of the physical environment.

2.22 The Pattern of Existing Land Uses

A city is the sum total of its own history to date - very little is the product of the previous twelve months. Antecedent patterns are inherited and linger. The use of a building may be easily changed for the cost is small compared with the capital invested in the building; the fabric changes less readily because of the cost of a replacement and the value of the building itself; the plan is most difficult to eradicate requiring the concerted action of many people (Conzen, 1960). Pre-existing

patterns of use, fabric and plan therefore shape the probable environmental character of an area, and influence the disposition of the various types of residential neighbourhood. Hoyt (1939) is not alone in suggesting that a suburb's initial character is often perpetuated outwards; Reeder (1968) describes a similar process in nineteenth century west London.

The symbolic effect of neighbouring land uses is paramount (Firey, 1945). Nottingham's social status was considerably raised when the Duke of Newcastle built his mansion, making the town a ducal seat and centre of attraction to people of quality in the neighbourhood (Straw, 1967, 101). Symbolism may also be negative; Cox (1965, 24) describes a linoleum factory in Croydon which caused bitter complaint. Indeed, of all the possible neighbouring uses, industry seems to have been particularly disliked by those of high status: journey to work in a pedestrian city ensured the co-existence of factories and working-class housing. The Ratcliffe Gate area of Mansfield contained many factories and much low value housing (Jennings, 1966, 98). In the later nineteenth century Edinburgh's Old Town was not only the largest lower class residential area but also the leading industrial quarter (Gordon, 1970, 78), while in Leeds the Aire and its tributaries provided the focus of a factory district interspersed with slum housing on ill-drained land (Ward, 1960, 83).

Other undesirable uses which might deter high status residents included canals, railways, mineral extraction and even ordinary commercial establishments. Cox (1965, 27) describes the development potential of part of Croydon during the 1870's in the following terms: "..... the flatness of the ground, its prone-ness to flooding and to gravel extraction, the slum tenements ....., the linoleum factory, and the presence of the railway, were all factors that might influence urban development in this zone." Elsewhere (ibid., 41) he states that, "The whole of this area was destined to be indifferently developed." After describing the

construction of the new residential streets in the district he comments, "Not surprisingly, ... these roads did not usually attract good tenants" (ibid., 43).

One particularly important aspect of the inherited housing stock is the age of the fabric. The role of ageing in determining rent levels and the social character of an area has received much attention in the literature, often being linked with the filtering process.

> "Houses with increasing age are faced with higher repair bills. This steady process of deterioration is hastened by obsolescence; a new and more modern type of structure relegates these structures to second rank. The older residents do not fight so strenuously to keep out inharmonious forces. A lower income class succeeds the original occupants. Owner occupancy declines as the first owners sell out or move away or lose their homes by foreclosure. There is often a sudden decline in value due to a sharp transition in the character of the neighbourhood."

Hoyt's generalized view (1939, 121) does scant justice to the processes of obsolescence. Lowry (1960) distinguishes <u>style obsolescence</u>, <u>technological obsolescence</u> and <u>physical deterioration</u>. Style obsolescence is of minor importance for architectural styles often evoke those of the past, identifiable newness is not desirable, and ageing may be counter-balanced by prestige and antiquity value. Technological obsolescence is far more significant. At a price, standards of heating, thermal insulation, plumbing etc. may be improved to modern standards, but some occupants prefer to move to a more modern house. Some features are intrinsic in the building layout. Servants quarters are rarely required by modern households and, making properties excessively large, present conditions ripe for subdivision - with all the effects that this has on the social character of such areas. Physical deterioration can be prevented given adequate maintenance and so must stem from the failure of the owner to perform ordinary repairs; this may be the logical reaction of a landlord facing falling rents because of style and/or technological obsolescence. <u>Site obsolescence</u>, in which invasion by immigrants or non-residential uses

reduce property values, and locational obsolescence (Grigsby, 1963) when the declining desirability of an area has similar effects, may further explain the landlord's falling income. If the rent falls below his total operating costs he will cut these costs wherever possible. Fixed costs must be paid under all circumstances, and user costs can only be cut by ejecting the tenant and forfeiting the rent income, so normal maintenance costs form the only possible area for economy. Failure to maintain the property reduces its residential attractiveness; demand and, therefore, rent falls and a viscious circle of non-maintenance takes over. Summarizing the impact of age in differentiating residential space, Simmons (1971, 131) writes,

> "The general pattern of variation in age of a city is radial, whether it be by means of the growth of a central core pushing rings of population outwards, as Burgess suggests, or extension of sectors as Hoyt predicts. In either case we have a set of concentric rings of different ages of development, each one apportioned and designed in accordance with the socio-economic forces of that period. Variations in the equilibrium conditions may produce changes in the proportions of land devoted to different uses, or a systematic pattern of variation in quality of use."

2.23 The Role of Transport in Controlling the Supply of Urban Residential Space

During the early nineteenth century, urban growth was achieved in considerable degree by increased residential densities. But later, transport improvements allowed longer journeys to work and so permitted suburbanization. The importance of commuting in the ecology of the modern city is well known (Danserean, 1961; Hauser, 1951). Some would claim that transport determined the whole suburban pattern - that where horse bus, tram or railway led, housing must follow. Such a view conflicts with historical evidence but even as a permissive force transport cannot be ignored. Transport improvements are selective - a narrow ribbon along tram routes or an island around each railway station being best served - and so lead to the differentiation of urban residential space. By

facilitating home/workplace separation, and by permitting lower urban densities, transport improvements have clear implications for the emergence of residential differentiation on the basis of life-style preference - particularly in large cities.

Ward (1960, 113) considers that the introduction of cheap regular passenger transport accelerated residential construction in Leeds but was symptomatic of rising real incomes amongst artisans in the period 1800-1900. Electric trams gave many the chance to live away from work and so made building land more valuable than it otherwise would have been (ibid., 117). As Ward points out, however, (ibid., 119) it was only as transport became cheaper, more regular and much faster after 1870 that it had an important effect on the growth of the urban plan: the early turnpikes had no effect as the many private horse bus services served existing residential areas alone. Ward concludes, "The provision of transport must be related to the availability of land for sale for building purposes. The Lidgett Park Estate was developed in relation to the tram service to Roundhay but the precise area developed was that incorporated within an estate purchased by a real estate speculator. Transport ..... appears to have been an important general rather than a specific factor conditioning the location of building developments, and in this wider sense the completion of the electrification of the tramways would also appear to ..... (have) contributed to the 'boom' in residential building" (ibid., 123-4). Gordon (1970, 238) agrees: suburban railway led to villa clusters at some, but not all, stations. Better communications allowed longer journeys to work; other factors decided whether and where this occurred (Rodgers, 1961-2; Dyos, 1953 and 1955-6; Dickinson, 1959-60).

A crucial feature of transport improvements is their differential relevance to upper, middle and lower status groups. Early public transport was expensive, slow and capable of moving only very small numbers; as

but a marginal improvement upon private transport adopted by the wealthiest, it offered the possibility of daily commuting from a suburban home to only a slightly wider income group. But as costs fell and systems expanded the suburban housing market was opened up to progressively lower income groups (Dyos, 1961) until, with the advent of mass-transit, all but the very poorest could afford to travel some distance to their work (Wingo, 1961, 201-2). It must be emphasized that transport improvements only offered the possibility of suburban residence: there was no compulsion, and without better reason than the provision of a tram service no one would prefer the expense and journey time implied by suburban residence. Nevertheless, the level of transport technology is a central determinant of the densities of residential development. In a pedestrian city a large city centre labour force necessarily implies high densities; with good, cheap public transport lower densities are possible. As transport improved through time the effects of former technological levels linger in the urban fabric, with higher density, older property concentrated in the centre.

Two further effects of transport merit attention. Firstly, railway construction often led to extensive demolitions (Kellet, 1969). Demolition of poor housing for railway construction in nineteenth century London, for example, led to serious overcrowding (Dyos, 1955). Secondly, the development of transport facilities leads to a reorganization of other urban land uses. Main roads often attracted commercial ribbons (Boal and Johnson, 1971, 370) while the effect of the railway was often that of an undesirable land use. "The railway lines, sidings and goods yards tended to depress adjacent site values and favour tenement development" (Gordon, 1970, 238). Coal and timber yards, warehousing, transport and industrial activities were also attracted to railway termini. Clearly, transport led - in various ways - to a considerable differentiation of urban space, and many of these effects lingered in established patterns of land use.

2.24 Land Ownership and Tenure as Conditions Influencing the Supply of Residential Space

In a similar way, land ownership effects are translated into the extant urban fabric: yesterday's pre-urban cadaster is today's street orientation in areas of terracing (Ward, 1962). Beresford (1971, 105-7) stresses the importance of long, narrow fields in fragmented ownership to an explanation of back-to-back courts in outlying parts of Leeds. By contrast, Leeds owes one of its few Georgian Squares (Park Square) to the continuity of single ownership in that part of the town; the housing there could only have been developed in a large holding, and so became one of the few areas of leasehold in a town characterized by small freehold units (Ward, 1960, 68). Even today, with Local Authority compulsory purchase powers, large units under single ownership are far more attractive to major development schemes. But in the nineteenth century land ownership was even more important and the attitude of individual landowners crucial. Gordon (1970, 80) describes the opposition of one owner to an improvement housing scheme for working class residents at Pilrig in Edinburgh. Scottish landownership and tenure law was influential: landowners had to choose the best time to develop their property in terms of the feu duty they would realize, so many areas were withheld from the market against better returns in the future (ibid.). Common land could cause many problems. Gordon (ibid., 236) considers that the Meadows would probably have been developed in the nineteenth century but for their protection as common land. Even when land was released for development there might be restrictive conditions. Many of Edinburgh's middle and high status areas resulted from conditions in feuing agreements which excluded undesirable uses (ibid., 237-8). Nottingham's enclosure act forbade buildings costing under £500 and all industrial premises; the area was thus developed as the exclusive high class residential district (Straw, 1967, 186) which it remains.

The absence of restrictions often caused low status development or rapid residential deterioration. Small planned projects in Edinburgh were unable to prevent low status residential development on adjacent sites "..... at least partly because of the absence of a general feuing design for the whole district" (Gordon, 1970, 238). Cox (1965, 57) suggests something of the inevitability of the process in his analysis of development in Croydon. "The land was sold, quite haphazardly, in narrow lots by an absentee owner. The particulars of the sale bore such phrases as, "plots for smaller houses or shops" or even "absolutely free from restrictions". Later ..... a land and investment company sold off the last remaining land ..... on building leases, with restrictions on the type of house to be erected ..... But by then it was too late."

The difference between various land tenure systems likewise had a powerful effect upon the fate of a newly developed area. Given a large number of different new owners, each with freehold title to his property, it is far more difficult for a former owner to control the land use changes which occur - whatever restrictive covenants were included in the original sale. By contrast the various leasehold arrangements allow the original owner considerable power to exclude undesirable and intrusive uses. This type of system may artificially maintain high status residential uses when residential deterioration or commercial invasion would otherwise follow, and land holding arrangements generally may operate to discourage the relocation of activities according to their rent paying ability by excluding unwanted uses from particular areas. The most flexible systems in this regard are commercial letting of premises to the highest bidder and, failing that, freehold ownership and a 'free market'; both encourage a suitable balance between rent-paying ability and site value.

Landownership and tenure, it appears, have a vital role in shaping urban development by determining when particular sites come onto the

market and by controlling (or not controlling) the uses to which they are put. At its most capricious, landownership allows the dictates of urban land values to be over-ridden and therefore offers an explanation for idiosyncracies of spatial form. Its effect in differentiating the urban residential environment is undesirable and, despite his interest in railways, Kellet (1969) found landownership to be perhaps the major influence over the shaping of Victorian cities.

2.25 The Local Building Industry as a Factor Conditioning the Supply of Residential Space

In view of its role, the local building industry may be expected to exercise a powerful influence over the residential environment. Small locally based building firms might be expected to prefer relatively small scale development, where the capital requirement was small; while large building firms from outside the locality might only be attracted into the area by an extensive development project where considerable scale economies might be achieved (Craven, 1969, 1-16). The size of landownership units might decide the question - with small local firms tackling only the smaller units. The precise structure of the building industry at any time, particularly in terms of the size of firms and their scale of operation may therefore be of considerable importance in explaining the development or failure to develop large areas of exactly similar housing. It may also help clarify the social character of the original development, for small building concerns which need to let housing almost immediately upon completion (to ensure a cash flow to finance the next development) may be attracted to the provision of poor quality low status housing rather than to the construction of fine private residences which may be empty for a year or more before a buyer is found.

The plan of nineteenth century Leeds, for example, was shaped by small scale enterprise and the profitability of housing as an investment in relation to income levels. "Economies of space no less than those of cost

were involved in the characteristics of the plan ..... The most effective economy of space ..... was obtained by building houses back-to-back ..... The ..... greatest economy ..... was the cellar ..... a completely independent dwelling unit often used as a lodging house for factory workers" (Ward, 1960, 89-92). This seems fairly typical for Chapman and Bartlett (1971, 238-9) describe how small investors in Birmingham provided capital for construction through subscription building societies; the small investors often alleviated the burden of their monthly subscription by building 'back houses' to provide themselves with a rent income. Treble (1971, 192) characterizes the speculative builders in Liverpool as typically 'small men' from the skilled artisans or lower middle classes, while Gordon (1970, 240) states that small housebuilders in Edinburgh clearly favoured small speculations within one district. Developers, he claims, "played a conscious part in creating status areas by their decision to build particular house types". Treble (1971, 171) shows that from 1838 Liverpool's builders and investors tended to divert their resources away from working class housing to provide more expensive middle class homes, which brought a more secure return.

As one of the less profitable means of investment, house-building attracted large scale investment only when other opportunities were drying up. This produced cyclic fluctuations in house construction, including the building boom in Liverpool 1844-6 (Treble, 1971, 170), that in Nottingham during the 1850s (Chapman, 1971) and that in Leeds 1874-7 (Ward, 1960, 112). Booms tended to be national, however, as between 1874 and 1877 due to "an increased availability of capital for building purposes in relation to other opportunity for investment" (ibid.). The building cycles led to the development of large areas of similar and contemporaneous housing, so producing relatively internally homogeneous housing areas within an expanding city. Areas built in such periods of speculation would be different in character from districts built "to order" in more normal times.

2.26 The Role of Local Government Influence, Control and Intervention in Conditioning the Supply of Residential Space

Conscious control of development is more prevalent than ever before. Right from the early days when by-law control of new housing (Ashworth, 1954, 90-1) ensured that the horrors of the past would not be repeated, through the era of green-belt and overspill policies, to the present concern with all aspects of environment, planning has profoundly modified urban land use patterns. Residential areas are now clearly differentiated by the policies and regulations in force when they were built - hence the contrast between by-law terraces and radburnized estates built to Parker-Morris standards. Building regulations controlling drainage and sewerage, natural lighting, and ventilation have greatly improved the standards of health which are accepted as normal - though again residential districts vary in the extent to which these and other standards obtain.

The potential effect of local government is considerable. Nottingham Corporation, for example, long resisted the enclosure of surrounding open land so that in the town itself houses were built on almost every available space; and back-to-backs were separated only by narrow yards to save the land a street would consume. "Nowhere else in England was congestion so great as in Nottingham" (Straw, 1967, 167). In 1874 bye law legislation was made compulsory in Leeds and established a minimum housing standard. "During the four decades before 1874, 54,700 houses were built ... most ... in the form of yard property, but in the four decades after 1874, 101,500 houses were built, most ..... in more open terraces of bye law standards" (Ward, 1960, 110). The decision of Edinburgh Town Council, in the 1880s, to purchase Braid Hills as a recreational area exaggerated the physical barrier and removed an area of potential residential land in a very attractive position (Gordon, 1970, 236).

Even more significant than planning control has been direct Local Authority intervention in urban development and redevelopment. Compulsory

purchase powers have been used to hasten slum clearance, and to facilitate rehousing in council estates, which have thereby transformed the urban residential structure. Herbert (1972, 181) argues that public sector intervention may have maintained the dimension of residential differentiation. "Socio-economic status is maintained because part of the criteria by which municipal housing is allocated ..... is based on income and occupation: it is, by and large, the lower-income ..... lower-status groups which are housed. Family status differences are also maintained because the system ..... gives priority to larger families ..... living in shared or over-crowded dwellings. ..... Again, the lack of variety and the immobility of tenants has allowed demographic and family status characteristics to change in situ, as a neighbourhood ages from one generation to another. Municipal householders tend to be immobilized because their right to that style of housing is not transferable from one municipality to another. The impact of this public sector housing on the ecological structures of British cities is best seen in its spatial expression. Municipal housing, often accounting for one-third or more of the total housing stock, is located both centrally and peripherally within the city and in virtually all sectors."

Local government intervention in the housing market in Britain appears to have confirmed a trend towards an increased scale of residential differentiation. Whereas, in a domestically organized economy, master and employees may live in the same building - the business premises - separation of workplace and residence, facilitated by transport improvements, certainly introduced a coarser grained residential pattern (Alonso, 1964, 167) and this was magnified by the development of a building industry to cater for large scale demand for working-class housing. But the council estate is an even larger homogeneous slab in the urban fabric, and with central redevelopment assuming greater importance the rougher grained

spatial differentiation is not a purely suburban phenomenon. Clearly, local government control and intervention has a profound influence upon the supply of residential space (as Kaiser and Weiss, 1970, admit).

2.27 Conclusion: Factors Conditioning Supply Within the Urban Residential System

It has been argued that a large number of factors are responsible for the environmental differentiation of urban residential space, and six of these have been examined in detail. The problem of integrating such factors within the full form-function-process approach is discussed in Chapter 10. The present work does not attempt to develop a completely integrated approach, for the main thrust of the argument relates to process and function. Nevertheless, some examination of spatial form is unavoidable and it is therefore desirable to outline the way in which it will be treated.

The approach adopted here is borrowed from Michelson (1970), who describes the human ecologist's incomplete conceptualization of environment in the following terms (ibid., 17).

> "The environment has been seen as a flat plane, with occasional internal boundaries such as railroads or parks which could set apart natural areas, within which subsocially determined aggregates jockey indefinitely for turf."

By "environment", human ecologists have meant <u>social</u> environment, as is clear from Quinn's assumption (1939, reprint 1961, 138) "..... that human ecology, as a branch of sociology, always studies the relations of man to man, and never the direct relations of man to environment ....." In the work of Talcott Parsons (1966) Michelson sees the beginnings of a solution, for Parsons championed approaches handling the relation of variables between systems. Until the two systems (here social structure and physical environment - see Figure 2.1) can be subsumed within a single explanatory view, the links between them must be examined. A deterministic model, with one system dominating the other, is unacceptable, and Michelson (1970, 26)

proposes an inter-system congruence model suggesting that certain states of variables in one system co-exist better with particular states of variables in the other system.

It should be possible to examine the relationship between the physical environment and the socio-economic structure in this way. We might, for example, expect higher status groups to concentrate in elevated, well-drained areas of mainly detached housing, where objectionable land uses were absent. There is a clear possibility of incongruence between the systems which permits an evolutionary perspective. Such a view may explain the gradual departure of high status residents from the city centre. Slowly the desirability of the central area was reduced by infilling and overcrowding, but most residents depended on central locations for their earnings and were unable to leave. An incongruence therefore arose between social status and environmental desirability: the group with "maximum choice" was - temporally - obliged to live in an increasingly unattractive area. The incongruence was maintained by other more functional relationships producing a conflict between life style and income goals. The rising commercial value of the city centre sites and a slight improvement in public transport might then be enough to tip the balance of advantage, making suburban residence economically viable, and later economically advantageous. Eventually land values rose so high as to make such an arrangement almost mandatory.

In the present discussion, therefore, an attempt will be made to assess the congruence between the evolving social groups and their residential environment. Individual determinants of this environmental character - such as transport, local government influence and the nature of the local building industry - will not be separately treated because the "quality of the residential environment" provides the general summary of such effects which is required as background to a process- function

approach. Furthermore, the major impact of public transport and of local government intervention post-dates the study period making it far easier to take all aspects of the residential environment together in this analysis. The varied residential environment is seen as the stage on which social processes were enacted. Chapter 3 considers how best to assess spatial variations in environmental quality in nineteenth century Wolverhampton.

2.3 Summary: Factors Conditioning Supply And Demand Within The Urban Residential System

The operation of the urban residential system has been portrayed as a process of perpetual competition between social groups for urban residential space. Demand in this system is seen to be shaped by those conditions which define the various social groups and the differences between them - broadly, functional differentiation determines the type of groups likely to be competing for space at any given time. Similarly, supply is conditioned by those factors which differentiate the residential spaces and determine the formal disposition of the various types of neighbourhood. Moreover, changes in the factors conditioning the demand for residential space have modified the patterns of social differentiation and form the focus of the present study. It therefore remains to specify the conditions of demand operating in each historical period and to derive the dimensions of social differentiation which resulted. Clearly, this is impossible without a parallel examination of factors conditioning supply in the residential system. The following stage model therefore traces the evolution of both spatial and social differentiation and so offers a generalized form-function-process view of residential patterns. Though form is tested, it will be remembered that interest centres on the evolution of the functional axes of residential differentiation.

2.4 A Stage Model View Of The Evolving Urban Residential Structure

The model described here differs from those discussed by Braithwaite (1968) in not being representations of explicit theory using a simplified, but formal, calculus. Rather, the term is used to refer to inter-related generalizations which are largely inductively based and upon which formal theory may be developed later. Such usage is frequent in the geographical literature (see Chorley and Hagget, 1967, for numerous examples). The stage model itself is a summary of the existing understanding of the temporal evolution of urban patterns in much the same way that the model of Taafe, Morrill and Gould (1963) summarizes the historical development of settlement and transport networks in colonial West Africa. As such the present model is far less rigorous than deductive theory proper, yet it is useful as a basis for theoretical development since it is capable of empirical testing.

Table 2.1 suggests the conditions of demand (and of supply) obtaining in the five stages recognized by the model. For clarity, simplicity and in recognition of the inductive origin of many of the generalizations, description relates largely to West European experience. Even so, it is possible to derive stage models for other cultural situations from different combinations of supply and demand elements.

2.41 The Feudal City

Contrary to Pirenne's view (1967, 99-100), a church, abbey or castle often provided the non-economic raison d'etre of settlement (Curl, 1972, 69-71; a modern example is provided by Seeman, 1938). A small elite performing religious and/or political functions therefore dominated the large lower class population that gathered to provide goods and services (Sjoberg, 1960, 110). The elite owned all the land; townsfolk held plots in return for obedience, tribute and service (Burrows, 1963, 37). The town's plan was dominated by the castle or abbey, giving the elite

Table 2.1 A Stage Model of Urban Residential Structure

Stage	Population Trend	Conditions Which Differentiate Households	Spatial Preferences	Spatial Form of Development
FEUDAL CITY	Fluctuating Stable	A Single Composite Socio-Economic and Family Status Dimension.	Universally for Central Locations.	Spreading Along Radial Routes From Centre if Growth Occurs.
MERCHANT CITY	Stable/ Slightly Rising	A Major Composite Socio-Economic and Family Status Dimension. Possibly a Minor Ethnicity Dimension. Possibly Occupation Where Guilds Powerful.	Universally for Central Locations. Perhaps Slightly Modified by Guild Influence.	Largely Spreading Along Radial Routes from Centre.
PRE-INDUSTRIAL CITY	Rising Gradually	A Major Composite Socio-Economic/Household Complexity Axis. Possibly a Minor Ethnicity Dimension Occupation?	Universally for Central Locations Unless Particular Trades Have Special Requirements.	Some Central Infilling Begins to Supplement Growth Along Radial Routes.
INDUSTRIALIZING CITY	Rising Very Rapidly	Socio-Economic Status and Family Status Gradually Emerge as Two Separate Dimensions. An Important Ethnicity Dimension.	Preference for Central Locations Challenged by Peripheral Preference Amongst Better-off Families. Effect of Trade Localization May Linger.	Rapid Central Inflilling Until Transport Improvements Permit Rapid Peripheral Expansion.
MODERN INDUSTRIAL CITY	Falling in Centre Rising on Periphery. Perhaps Eventually Tending to Stability?	Socio-Economic Status, Family Status, and Ethnicity as Three Separate Dimensions	Central Preference by Non-Familists. Peripheral Preference by Familists.	Peripheral Expansion and Central Redevelopment. Perhaps Tending to Eventual Equilibrium.

a centrality (Mumford, 1966, 349) corresponding to its importance for the service population (Curl, 1972, 72). If proximity to the elite was advantageous it might be a sign of success to hold an inner plot, but the feudal city was very small and locational inertia was considerable. Since the elite's power was absolute, and the town's plan functionally based, it is likely that preferment to a particular office implied proximity to the elite - even a specific house. New arrivals were cetainly relegated to peripheral areas, but formed a ring of very low status only in a notional sense: the town being very small, most accretion was along street frontages and the town's external relations shaped its plan (Bourne and Barber, 1971, 258-9).

There was a single axis of differentiation (Timms, 1971, 145) - the elite being better educated, better housed, and alone able to sustain the esteemed extended family pattern (Sjoberg, 1965, 216-20); fertility too may have been higher amongst the elite (Freedman, 1961-2). Industry was domestically organized, with the baker or shoemaker manufacturing, storing and retailing in the single premises that formed his home, and employing other members of the family - so supporting a quasi-extended-family pattern as the trade passed from father to son. But if (as Sjoberg, 1960, 83 suggests) such traders were excluded from the elite because mundane money-making conflicted with the religious-philosophical value system of the dominant group, this situation could not last long (Timms loc. cit.). Increasing trade raised the status of some traders, and introduced a small alien element. The need for organization and government increased too, raising the possibility of merchant participation in the power structure.

2.42 The Merchant City

The Merchant City witnessed a gradual decline in the power of the old elite performing non-economic functions and the gradual ascendancy

of a merchant clique which was to dominate the Pre-Industrial City. The guilds often took a dominant role during this transition, but the situation varied from city to city. For this reason there is disagreement about the social geography of the Merchant City. Sjoberg's description (1965, 216) of a city in which "the elite typically had resided in or near the centre, with the lower class and outcast groups fanning out toward the periphery" is not greatly different from the feudal city. Vance's (1971, 105) guild-controlled patchwork of occupational zones located by "accident rather than rent paying ability" may represent one possible intermediate situation: the power of the elite had waned, that of the merchant clique had scarcely begun, so the guilds filled the vacuum. In describing a situation "more complicated than any of the archetypes of Sjoberg or Vance" with a "merchant clique ..... pre-eminent in wealth and municipal power", Langton (1975, 21) portrays a city much later in the transition and much closer to the Pre-Industrial type.

As the influence of the old elite waned the increasing wealth of certain merchants and their participation in civic affairs provided them with higher status. A market often developed by the original castle or church. "The original church ..... became the market church, since the markets were held under its walls ....." (Curl, 1972, 70-1). Later, the market might be relocated to reduce congestion, and abbey and market formed twin foci of the growing town. Mumford (1966, 291-1) catches the essence of these changes.

> "The fact that the merchants represented a new class can be deduced from their topographical position in the newly laid out 'suburb' ..... If at first the castle or monastery was the town centre, after the eleventh century the fresh activities of the community began to shift towards the market-place ..... In the medieval town these powers, the spiritual and the temporal ..... achieved something like an equilibrium ..... The practice of granting freedom to cities ... was ... a renunciation, on the part of the masters of the citadel, of the very tributes and exactions that originally had brought the city into existence. Though the castle often towered grimly above the city, always threatening to resume its original prerogatives, in the free cities feudal lordship took a place as just another semi-corporate entity: first among equals."

The power of the feudal lord slowly waned. "With the revival of trade ..... merchant classes and guilds developed which came into conflict with secular powers. ..... When the town party was victorious, the castle was destroyed because it symbolized the power of the nobility" (Curl, 1973, 72-3). New towns arose too, based on the expansion of trade (Mumford, 1966, 350). The market square then formed the focus of the town and, with economic activity still domestically organized, the richest merchants lived around it. Where guilds were pre-eminent guild houses often fronted the square and some pattern of exclusive occupational zones might be imposed. The special needs (water, accessibility etc.) and unpleasant characters (smell, noise etc.) of certain occupations also encouraged occupational segregation. The urban pattern combined all these influences and locational inertia too; even the role of 'rent paying ability' should not be ignored, for the most successful traders increasingly dominated local power structures.

Central locations remained the most desirable, plot repletion was limited - even at the centre - and new arrivals still added to the straggling street frontages in peripheral areas. Some newcomers were, however, accommodated in their employers' households, so the central areas were differentiated on the basis of both status and of household composition: the households of handicraftsmen/retailers contained an extended family and employees all engaged in the family business. The city outskirts housed relatively more of the small households of the lower status groups, unable to support an extended family pattern (if only because the centrally located merchant community included a disproportionate number of higher status households). Similar concentric zonal patterns with status declining outward have been reported in Latin America (Schnore, 1965, 392-8 cites many examples), in Asia (Timms, 1971, 220 cites many) and in some modern European cities (McElrath, 1962; Caplow, 1952; Beynon, 1943).

The single axis of differentiation incorporating both economic and family status elements persisted. Aliens may have formed a favoured or

disadvantaged group within this ranking system, but more probably ethnic status emerged as a separate - minor - dimension of residential differentiation, expressing a concentration of aliens not due to their social status alone. Where guilds were dominant or where there were other reasons for occupational zonation there might be a differentiation by occupation largely independent of social rank: complete independence is unlikely in view of the elevated position of merchants and dealers.

As the Merchant City grew with the expansion of trade, the merchant community slowly replaced the old elite. A larger population also permitted greater occupational specialization, further increasing the number of social strata; in this way the pattern characteristic of the next stage began to emerge.

2.43 The Pre-Industrial City

The Feudal City was characterized by rigidly dichotomous social stratification setting the elite above the rest of the population. In the Merchant City this rigidity had eased, and there were rather more social strata; gradually the increasing specialization of the population brought further fluidity. The non-economic elite had been superceded by an upper-middle class group of local traders by (and for) whom the town was governed, with voting tied to a property qualification or limited to freemen (Vigier, 1970, 45-6, 69-71, 82 and 145-53). The situation resembles Layton's description (1975, 21) of mid-seventeenth century Newcastle, where a "merchant clique was pre-eminent in wealth and municipal power". The main difference lies in the continued importance, at that date, of guilds. These had declined by the period immediately preceding industrialization and, once landownership had definitely replaced land holding, the activities best able to pay - more than ever before - occupied favoured central sites (Mathie, 1973, 26-7). Some localization of occupations persisted - the external economies of clustering in a

city with poor communications, the magnetic effect of certain locations over trades with special requirements, the ostracism of offensive trades, and geographical inertia saw to that. But the trend was towards location commensurate with rent-paying ability.

Major economic activity, therefore, concentrated in city centre street-fronting property which also housed the trader, his family, servants and employees, and formed the locus of manufacturing and storage too (Chapman, 1971, 136). Since transport was slow and costly, decentralization of residential, manufacturing or storage functions was difficult, and the retailing area was most easily expanded by relocating such functions behind the main street frontage. As commercial activity expanded, therefore, the tails of burgages were built upon. The origin of the pattern which Engels (1844, reprinted 1969, 80 and quoted in section 2.44) found so objectionable undoubtedly lay in the pre-industrial period and earlier (Beresford, 1971, 98-9). Nevertheless the city centre remained a high status area: Chapman (1971, 137-8) describes mean cottages inhabited by the poorest classes along the margins of Nottingham even in 1750.

If the extended family pattern had not already declined, the pre-industrial era probably saw its virtual extinction - at least in Britain. The implications of this for the dimensions of residential differentation are examined in Chapter 5, but briefly it may be posited that the inter-dependence of socio-economic and family status axes was maintained because upper status groups continued to have more complex household patterns (including employees etc.) even though their family patterns had become simpler. The pre-industrial urban residential pattern was therefore dominated by a composite social and household status dimension, with perhaps a minor ethnicity axis reflecting a small alien group, and an occupational dimension where marked localization persisted.

2.44 The Industrializing City

In the Industrializing City major changes were underway. The volume of trade was growing, necessitating transport improvements (Curl, 1972, 131-2; Vigier, 1970, 12) which expanded the trading hinterland so increasing the scope for product specialization. The external relations of cities (Pred, 1962) increased, generating greater interdependence and increasing societal scale (Gibbs and Martin, 1958). Technological advances offered greater economies of scale, producing bigger and bigger manufacturing establishments (Berry, 1973, 4-5) and increasing the "exports" on which each city's growth depended (Jacobs, 1967). The factory gradually replaced domestic industry and per capita product soared. Though this does not necessarily imply a similar separation of retailing from residential premises, the causal connection is clear. Factories had attracted large populations to the cities. As per capita product rose too, the value of business conducted in city centre shops, markets, banks and offices increased dramatically. This raised the value of street-fronting city centre premises and initiated a series of major changes in urban structure.

The greater the value of street-fronting city centre commercial property, the greater the opportunity cost to the trader of city centre residence, production and storage. Transport was private, slow and costly making it difficult for the trader to transfer his manufacturing activity to the urban periphery. More important, once factories reduced the significant of such handicraft production, his employees could not be moved far from their work without great expense and inconvenience. Moreover, the proprietor and his family considered the trade premises their home and were indisposed to view the cost of moving house while the city centre remained residentially attractive - especially since obvious and cheaper alternatives lay close at hand. Plot repletion had

only begun near the city centre, so there remained a considerable area of unused land close to the commercial core though behind the main street facade. Consequently, a trader wishing to expand inevitably began to use the land behind the street fronting property, and what had been a sporadic practice in the pre-industrial era became an irresistable trend as industrialization progressed. Owners who had no need to develop the unused parts of their plots began to build cottages, courts and alleys in order to capitalize upon the growing demand for housing in the city centre. Employees were moved into small cottages packed into the employer's plot alongside extra workshops and new storage space, or else left to find their own accommodation as close to work as possible. A very fine scale of residential differentiation emerged in central areas, with the 'new elite' of traders and dealers along the main street frontages and their employees crammed into courts and alleys behine the imposing facade. Engels (1844, reprinted 1969, 80) commented,

> "I know very well that this hypocritical plan is more or less common to all great cities; I know, too, that the retail dealers are forced by the nature of their businesses to take possession of the great highways; I know that there are many more good buildings than bad ones upon such streets everywhere, and that the value of land is greater near them than in remoter districts; but ..... I have never seen so systematic a shutting-out of the working class from the thoroughfares, so tender a concealment of everything which might affront the eye and nerves of the bourgeoisie ....."

Engels was describing the way a commercial facade lined roads out of central Manchester (- a pattern which developed in Wolverhampton too -) but its relevance to the repletion of central plots is clear. Beresford (1971, 99) documents this type of low grade residential infilling in Leeds too.

Slowly, plot repletion reduced the desirability of the central area for residential uses by affluent traders. Environmental deterioration and the escalation of the opportunity cost of central residence encouraged the wealthy dealer to put in a manager, to build a house for himself and

his family on the nearest edge of town, and to travel the short distance to work. In Leeds, for example, development began "for the much smaller number who could afford elegant housing" (Beresford, 1971, 101). Many prosperous traders continued to maintain large, complex households in the city centre for a considerable period, ensuring that the link between socio-economic and family status dimensions was dissolved only gradually.

Industrialization, a rapid influx of population, infilling between main streets and plot repletion slowly transformed the city as most available space was filled with courts and alleys and net residential densities rose alarmingly. The image of the city was transformed too: once the proud bloom of the surrounding countryside and focus of its local region, the urban area became an ugly blot. Environmental preferences began to change. Concrete evidence is rare, and the validity of the case can only be suggested. There is, however, a clear difference between the preference of the old elite for central residence in order to be at the hub of activity and control (Curl, 1972; Mumford, 1966) and the following near caricature of the preferences of the new industrial magnates.

> The " ..... ambitious merchant or manufacturer who exalted work valued idleness as a badge of status: it showed ..... that one was 'a gentleman of independent means'. But more important, even as he threw himself ardently into his work, he longed for a life of ease. Not of mere ease - of luxurious ease. At the heart of the bourgeois dream was the ideal of gracious living, symbolized by the country house. The middleclass businessman longed to escape from drudgery in hideous surroundings into a world of beauty and leisure, a life of dignity and peace, from which sordid anxieties were shut out. This was the vision which the 'Goddess of Getting-on' held up before ..... captains of industry."

Houghton (1957, 190) goes on to quote Ruskin (reprinted 1902-12, 453).

> "Your ideal of human life then is ..... that it should be passed in a pleasant undulating world, with iron and coal everywhere underneath it. On each pleasant bank of this world is to be a beautiful mansion, with two wings; and stables, and coach house; a moderately sized park; a large garden and hot houses; and pleasant carriage drives through the shrubberies. In this mansion are to live ..... the English gentleman, with his gracious wife, and his beautiful family; he always able to have the boudoir and

> the jewels for the wife, and the beautiful ball dresses for the daughters, and hunters for the sons, and a shooting in the Highlands for himself."

With this as an ideal the desertion of the city centre for the quieter suburbs, by those who could afford to do so, is hardly surprising (Low, 1891). The new attitude has been noted in nineteenth century Glasgow (Simpson, 1970) and more generally (Lawton, 1972, 212). Dyos (1961, Chapter 3) describes an increasing readiness to travel to work which encouraged the growth of Camberwell; Gordon (1970, 239), working on Edinburgh, isolates a "desire for semi-rural residential settings with detached houses set in gardens" which "sponsored a phase of space consuming villa districts from the middle of the nineteenth century".

Escape to the rural periphery became imperative, but the absence of public transport limited suburban residence by city workers to the wealthier groups able to afford private means of transport. Suburban residence is preferred it is claimed (Bell, 1958 and 1968) by those of familist orientation who prefer a spacious and healthy home and environment in which to raise children rather than proximity to work. Accordingly, it is only when all income groups can afford to live in the suburbs, should they so wish, that the family status-life style axis achieves complete independence of socio-economic status. Public transport was developed only gradually, and only slowly became cheaper so that people of lower and lower income could choose to commute to work. Hence family and social status dimensions diverged little by little as urbanization progressed, workplace and residence were separated and the bond holding together complex households was dissolved. With this evolutionary process new household forms arose based upon life cycle variation and life style differences, but only to the extent that different life-cycle stages could be acted out in different areas did the family status dimension achieve independence of socio-economic status. Slowly, however, two separate axes emerged.

As home and workplace became separated the importance of occupational segregation must inevitably decline (Warnes, 1972) for differentiation by social and family status is the emerging structure. Residential areas also began to differ more markedly in physical respects as a building industry developed which catered for new suburban demand, and that for cheap working-class accommodation close to work, and one which catered for this demand by building relatively homogeneous groups of houses aimed at a particular 'market'. The urban fabric itself became more differentiated, reflecting a more stratified urban population. Finally, increased economic activity attracted labour to the city from further and further afield introducing a very definite and important ethnicity dimension as impoverished immigrants clustered in the only accommodation they could afford - the cheapest, the worst and the most overcrowded in the city. Lodging and multiple occupancy were common amongst these newcomers.

2.45 The Industrial City

In the modern Industrial City social stratification is far less rigid than ever before with many different levels based on specialization of skills. Production is organized in large factories, allowing wide separation of home and workplace. Occupational segregation is far less important in explaining residential patterns, but has still not been totally displaced by social status differentiation. Occupation (i.e. industrial category) may be highly predictive of social class, and the tendency to minimize journey to work time/cost leads to localization when employment in an industry is concentrated. The classic understatement is provided by Duncan and Duncan (1955, 503). "There is evidence that residences are not distributed randomly with respect to places of work." Nevertheless occupation is less important as a dimension of differentiation than previously.

The nuclear family is dominant, allowing great life-cycle variations in household composition independent of social status. Family status and socio-economic status consequently form separate axes of residential differentiation. Large variations in household composition which are independent of social status also arise as a result of the wide choice available between alternative value orientations. Orientation towards career or consumption - rather than family - is open to all social levels, with a wide range of opportunities for women to work outside the home.

With industry no longer domestically organized, and because the urban environment has been transformed by population increases, the city centre is no longer thought a good place to raise a family. Newer property tends to be peripherally located so those of familist orientation generally prefer suburban residence. This is now available to virtually all income groups and family status forms a zonally distributed differentiating dimension independent of socio-economic status. The wealthy occupy the prosperous sector(s) that grew outward from the city centre (perhaps starting from the first merchant-town-houses on the edge of the commercial core) so social status is sectorally arranged. Finally, ethnic minorities tend to live in segregated sub-communities, often in older housing that is beginning to decay; but, with time, less conspicuous groups may be assimilated to the host community. While ethnic areas persist their distribution is a sporadic, nucleated one, close to the city centre where old property predominates (Duncan and Lieberson, 1959). Much recent evidence suggests a decentralization of ethnic groups (King, 1968) and the development of minority (negro) suburbs in American cities (Farley, 1969). Ethnicity generally forms an independent dimension of residential differentiation.

2.46 The Stage Model and its Wider Application

The five stages recognized differ in respect of the conditions which differentiate the supply of and demand for residential space. They are arranged chronologically and the intervening changes are specified - though it is not suggested that the evolutionary sequence is inevitable. The conditions influencing supply and demand are stated in general terms to admit non-Western systems of social stratification, family structures and ethnically-based caste arrangements; generally, the world-wide trend is towards industrialization, and though societies start from different points they are moving towards a single almost universal pattern.

Brief consideration of Redfield's folk-urban continuum (1941), developed in Yucatan, illustrates the point. Redfield discussed four communities at different points on the continuum. Tusik, a tribal village of 100 people, was very isolated, sold chickle to travelling merchants and grew maize solely for local consumption; the villagers were part of a homogeneous Indian tribe. Chan Kom (250) was a day's walk from the railway and sold maize to buy necessities; there was no occupational specialization or social heterogeneity, and only one family could speak Spanish as well as Maya. Dzites (1200) was a production and shipping centre for maize which went by rail to Merida; the few specialized occupations included judge, butcher, school director and telegrapher, providing the basis of a class hierarchy; most of the upper class was not native. Merida (100,000) had a population heterogeneous by origin, race and language; the clear class structure was dominated by a wealthy, educated minority; and the complex division of labour in manufacturing, commerce, banking, government and education produced a very stratified social system.

Redfield's examples are far wider ranging than the model presented above, and no attempt is made to fit tribal villages into the historical

sequence. Yet the trends strongly mirror the increasing inter-dependency and specialization suggested by the model as characteristic of increasing societal scale. The development of social stratification based on occupational specialization, and the increasing racial and ethnic heterogeneity also strongly resemble model elements. While the model describes West European experience, therefore, many of the changes isolated are of wider application.

2.5 Hypotheses Concerning The Residential Structure Of An Industrializing Town

It was argued earlier (Section 0.4) that the industrializing phase formed the only relatively brief period in which the hypothesis of temporal evolution in the dimensions of residential differentiation might be tested. It was also noted that the expected patterns and changes must be specified in great detail before such testing could be undertaken. The stage model just described provides the necessary detail and so permits the statement of precise hypotheses about the residential structure of an industrializing town. Of central concern are propositions regarding the dimensions of residential differentiation and the changes that these underwent during the period; this process-function view is presented first. Following this, a briefer treatment of spatial form is also attempted.

2.51 "Functional" Dimensions of Residential Differentiation and Their Temporal Evolution ("Process")

Early in the industrializing process the major axis of urban residential differentiation was a socio-economic status dimension, but with family status measures strongly associated therewith. As industrialization progressed, socio-economic status and family status dimensions formed increasingly separate and independent axes. Initially, household complexity was strongly associated with high status domestically organized trading occupations, but the link gradually evaporated as domestic organization disappeared and the spatial separation of home and work

affected even trading concerns. Similarly, occupation formed a significant - but waning - basis of residential differentiation as the imperative of proximity to work gave way to greater environmental choice (at least for the better-off). Occupation was therefore superceded by an independent rank-based socio-economic status axis. If upper status groups embraced non-familist orientations first, there may have been an increase in class fertility differentials until such life-styles became more widely available.

Ethnicity was, at least initially, an important dimension of residential differentiation and was associated both with overcrowding and with household complexity due to the prevalence of lodging and multiple occupancy amongst newcomers. Certainly overcrowding and household complexity declined as growth rates began to fall off, and it seems likely that - at least in Britain where ethnic minorities could not be identified by the colour of their skin - the importance of ethnicity as a basis for residential segregation also began to wane in the later phases of industrialization. In the long term, assimilation to the host community is to be expected.

2.52 The Emerging Spatial Pattern ("Form")

In the early stages of industrialization the city centre retained enough of the high status population to be considered a high status residential/commercial area, but a suburban wedge of high socio-economic status had already begun to emerge. The high status sector was located well away from the undesirable land uses around which the lower classes lived, and was attracted by well-drained and high land. Notwithstanding the existence of a high status sector, suburban residence generally was of higher status where employment was concentrated in the city centre, for low status groups could not afford long commuting before the advent of cheap public transport. As socio-economic and family status diverged,

however, their independence was reflected in their opposed spatial patterns - the former revealing a sectoral arrangement and the latter a zonal one. Ethnic minorities clustered in one (or very few) fairly central area(s), though tending to expand outward as time progressed.

2.53 Concluding Remarks

It must be emphasized that the foregoing model is a largely inductively based summary of historical changes in urban structure. This model must be treated as a series of related hypotheses about the residential patterns which might be expected in (for example) a town undergoing rapid growth and urbanization. Though the model lacks the rigour of formal theory it is nevertheless suceptible to empirical testing. For the present analysis therefore it remains to assess the value of the model as a description of the processes operating in mid-nineteenth century Wolverhampton. Before this is attempted, however, it is necessary to examine something of the town's development to that time and to sketch the environmental circumstances within which social differentiation operated.

CHAPTER 3 NINETEENTH CENTURY WOLVERHAMPTON: AN INDUSTRIALIZING TOWN

3.1 Introduction

The major social upheavals which affected nineteenth century Britain are well documented. Houghton (1957, 1-2), for example, discusses contemporary views of that period.

> "In 1858 a Victorian critic, searching for an epithet to describe "the remarkable period in which our own lot is cast" did not call it the age of democracy or industry or science, nor of earnestness or optimism. The one distinguishing fact about the time was "that we are living in an age of transition" (Holland, 1858, 71). And it is peculiarly Victorian. For although all ages are ages of transition, never before had men thought of their own time as an era of change from the past to the future. Indeed, in England that idea and the Victorian period began together. When John Stuart Mill in 1831 found transition to be the leading characteristic of the time ..... he noted that this had become obvious to the more discerning only "a few years ago", and that not "it forces itself upon the most unobservant" (Mill, 1942, 6). ..... Christian orthodoxy under the rule of the church and civil government under the rule of king and nobility; the social structure of fixed classes, each with its recognized rights and duties, and the economic organization of village agriculture and town guilds. This was the old European system of dominant ideas and facts which (was) dissolving in the nineteenth century."

Though Evans (1968) romanticizes English society before 1750, his description of the destruction of this "old communal England" isolates the major trends. The agricultural revolution and Enclosure Acts provided more and better food for the growing industrial towns but, he argues, produced a new capitalist class of large landowners unconscious of their responsibilities for their workingmen. Inventions of men like Watt and Darby led to the production of consumer goods on a scale previously undreamt of. There followed

> "..... a half century or more of vast, uncontrolled, inchoate, thrusting, surging growth and change, in which adventurous masterful men gained place and fortune, and the country as a whole moved to new pinnacles of wealth and power. The business was in no way planned or controlled; the new structure of society came into existence piecemeal, by the unco-ordinated efforts of individuals progressing forcefully, but ignorantly, in unknown fields, under conditions which placed the unscrupulous, unimaginative, hard-bitten type at a great material advantage." (ibid., 1-5).

Such a view is almost a caricature of the industrializing process but, as Evans points out (ibid., 1), "new classes had appeared for whom there was no place in the existing structure." He sees the decade 1860-70 as a watershed (ibid., 149); thereafter, new values began to emerge.

> "The first chaotic experimental stage of the Industrial Revolution was over, and society was beginning to form an ordered pattern. By now most of the work had been graded, and the population showed a corresponding stratification. The complex structure of the modern industrial State was becoming recognizable." (ibid., 151)

Some would not agree with the details of Evans' case, nor with the chronology he suggests. Oman (1899) adopts 1852 as the pivotal year. But disagreement about the date by which major changes were completed only emphasizes the gradual and evolutionary character of a transition occupying several decades. Houghton (1957, 3-4) admits that destruction and reconstruction had begun by 1830, but that the new order was not fully apparent until the late nineteenth century.

The population was larger than ever before, and increasing rapidly still further (Harrison, 1973, 1). The precise causal link between this population growth and the rapid advance of industrialization is controversial (see Flinn, 1970) and it is sufficient to notice that by the mid-nineteenth century Britain was experiencing considerable population growth and rapid industrialization. The new conditions promoted the construction of new towns devoted to factory production and internal migration concentrated the national population growth there. Improved transportation further encouraged the concentration of factory production - and of population - in urban areas. When it is remembered that Irish immigration was also directed mainly towards the towns and cities, it is clear that a very great increase in the demand for urban residential space must have resulted. (Table 2.1 admits the importance of such population trends). Whereas in 1831 only a quarter of the population of England and Wales lived in towns of over 20,000 people, by 1881 70% did so. The growth

of Wolverhampton formed part of this national trend towards urbanization and industrialization.

3.2 Wolverhampton: Population Trends And The Introduction Of Large Scale Production

It is known that a religious foundation existed on the present site of Wolverhampton as early as 996 AD, for at that date Lady Wulfruna made a gift of land to the church, (Avery, 1948, 13-15). Up to the sixteenth century the town grew gradually as a result of the establishment of a Court Leet in the town and because of the prosperity of the wool trade. From the sixteenth century onwards, however, cloth production became increasingly concentrated in Yorkshire and the town's growth was hampered. By the late seventeenth century there were signs of a revival in the beginnings of the coal and iron industry, and Wolverhampton's position became increasingly important. The physical environment is examined in detail in Section 3.51, but it is pertinent to notice that Wolverhampton grew on the top of a sandstone ridge; to the north and west of the town were rich fertile fields upon which the town's early development had depended, but to the south and east were outcrops of the coal measures which were to be so important for the future. This north-west/south-east dichotomy was to have considerable effect upon patterns of residential differentiation which emerged as the town expanded, for the north and west were far more attractive for residential use than the south and east. The latter were, however, potentially important industrial areas.

As early as 1750, Taylor's map lists many metal trades in Wolverhampton; but early development was by mere proliferation of small scale workshops and not fundamentally different in kind from the age-old metalware craft trades of the surrounding district. In 1770, for example, there were 102 master bucklemakers in Wolverhampton working in steel (Burrows, 1958?, Part I) but no large "manufacturies": the "mechanics" worked in small

shops adjoining their dwellings. In 1750 about 1440 houses, with a total of 7545 people were concentrated on the few "narrow and crooked" streets "situated close to the market-place" (Jones, 1903, 4) and Wolverhampton was "a little huddled town on a hill, scarcely more than a village ....." (Avery, 1948, 25). When Yates produced his map of Staffordshire (1775) the area was still barely affected by the Industrial Revolution, with few signs of the rapid industrial and urban expansion that was to transform the region. A rather sparsely populated area contained, instead, the four small market towns of Dudley, Wolverhampton, Bilston and Walsall, and many small partly agricultural villages (Davies and Hyde, 1970, 3).

The industrial growth of the area would have been impossible without dramatic transport improvements which allowed output to be sold outside the locality. The Severn, offering cheap water transport, was nearby but access depended upon wholly inadequate roads over the ridge, at either Penn or Dudley, and on to the river port of Bewdley. Goods from the Black Country had to be carried laboriously to Bewdley by packhorse or waggon. Heavy traffic, including ox-drawn waggons full of local coal, slowly destroyed these roads. Turnpiking improved matters but tolls rose steadily. Between Wolverhampton and Dudley, mining of thick coal near to the surface made it impossible to keep the turnpike on solid foundations: a fall of three feet overnight was common! But road improvements alone could never have accommodated the bulk movement of coal, iron and limestone which was to form the basis of the area's industrial development.

This awaited the development of canals. The area had no navigable waterways and only poor roads, so when the Staffordshire and Worcestershire Canal - passing within two miles of Wolverhampton - was being built to link the Severn and Trent, the Birmingham coalmasters built the first

branch canal in England (1772) from Aldersley via Wolverhampton to Birmingham. The cost of transporting Black Country coal to Birmingham was halved. More canals followed and at last the Black Country was linked directly with the Severn through the Dudley Tunnel. By 1844 the Birmingham-Wolverhampton Canal was the most important in Britain with an annual revenue of £130,000, but the canal era was drawing to a close: railways were expanding rapidly.

The canal had an important impact on the area's development. Not only was coal mining given a great boost, but new industries were attracted to the area. John Wilkinson brought experience in iron making from Broseley in Shropshire and succeeded in using raw South Staffordshire coal in his furnace by harnessing the steam engine to provide a "cold-blast". The inadequacy of South Staffordshire coal for coking was finally overcome on the introduction of the "hot-blast". Morton and Le Guillou (1967, 274) consider the reasons for Wilkinson's move.

> "Undoubtedly Wilkinson had been attracted to the plateau area because of its abundant supplies of raw materials, but he also may have had a shrewd idea of ..... plans for canal building ..... (A) map showing the location of blast furnaces built between 1796 and 1806 ..... (shows) that canal banks provided the best sites for the South Staffordshire ironmaster ..... Indeed, two furnace sites ..... not ..... on canals ..... had ceased to exist by 1840. Canals not only provided for the easy transportation of heavy goods within the Black Country ..... but ..... also provided a steady and cheap means of transport to most parts of the country, including the ports for America."

By 1800 Wolverhampton's population of over 12,000 was nearly twice that of 1750 and it was an industrial town of growing importance. Though the first significant iron making enterprise began shortly after 1800, Pitt's account of 1817 still evokes much that is characteristic of a late pre-industrial town. "Wolverhmapton stands on a rising ground, is a considerable manufacturing town, and ..... has a weekly market ....., and one annual fair ..... The population ..... has increased more than two-fold since 1750; in that year ..... 7454, in 1801 12,655, in 1811 14,836 ...

The town is surrounded by gardens, and the air generally healthy: a navigable canal from Birmingham passes through it on its eastern side ..." (Pitt, 1817, 167). But by 1820 rapid change was underway. Lewes, writing in a Topographical Dictionary (1848) gave a long list of tools and equipment made, including "Smiths' and carpenters' tools, files, nails, screws, gun-locks, hinges, steel-mills and machinery; locks, furnishing ironmongery and cabinet brasses; with every branch of the iron manufacture". There were, by then, several large businesses well established and employing large numbers. The biggest were concerned with iron: Chillington Works, started in 1822, (Morton and Le Guillou, 1967, 276), employed about 1000 workers and its four blast furnaces, forges and mills produced "400 tons of finished iron per week" (Lewes, op. cit.) while the Shrubbery Works, established in 1824, "for the manufacture of boiler plates and all other descriptions of best iron" (ibid.) employed about 650 men and produced 300 to 500 tons of iron weekly. Wolverhampton's Official Handbook (Burrow, 1953?, 115-205) lists several present day businesses established around the 1820s and 1830s and engaged in iron founding, file manufacturing, and leather trades; the later edition of the Handbook (ibid., 1958?, 97-139) provides further examples. From the 1820s population rose very rapidly: 1821, 18,318; 1841, 36,382; and 1861, 60,858.

The advent of the railway brought further industrial expansion and because of the rivalry between railway companies the town enjoyed two separate systems providing links with Birmingham. Tin plating and japanning (ornamental lacquer work) doubled in importance in Wolverhampton during the period 1849 to 1865 and several factories were opened employing large numbers. Loveridge (1866, 121-4) mentions 14 tinware and japanning factories in Wolverhampton and quotes an unspecified Government Report of 1864 showing that some of them employed up to 300 people. Galvanizing factories in Wolverhampton are also noted. Lock-making was very important

in Wolverhampton, and though most production was by outworkers in their own workshops, larger scale enterprises were also established.

By 1851 Wolverhampton must have been well into the transition from pre-industrial to industrial urban patterns so, despite the shortness of the intervening period, significant changes in the hypothesized direction are likely to have occurred by 1871.

3.3 Residential Patterns In Wolverhampton Before 1851

3.31 Spatial Patterns: the Evidence of Rate Books 1777-1829

It has been suggested that the pre-industrial pattern with central high status areas persisted into the early industrializing city (where it was gradually replaced by the modern pattern described by Burgess). The validity of this assertion must be examined in relation to Wolverhampton's early development, for the hypothesized changes in the dimensions of residential differentiation are unlikely to have occurred except from the type of pre-industrial pattern specified. But statistical evidence is difficult to find and several sources were investigated. Trade directories for the period before 1851 seemed a possible source, but attempts to plot the distribution of "nobility, gentry and clergy" (the only identifiable high status group for which private addresses seem invariably to be given) were thwarted by the absence of street numbers at this early date. This may seem a trivial matter, but many radial roads retained the same name almost from the town centre to the boundary.

Rate books appeared more helpful, but here too there were problems. The major difficulty arose from the failure to separate the rateable value of composite premises into residential, commercial and industrial, so that whilst mean rateable values were easily calculated it was impossible to assess the influence of high value business premises upon the results. The only allowance which could be made was to map "mean rateable value per unit" (Figure 3.1 for 1777, Figure 3.2 for 1829) by counting "house

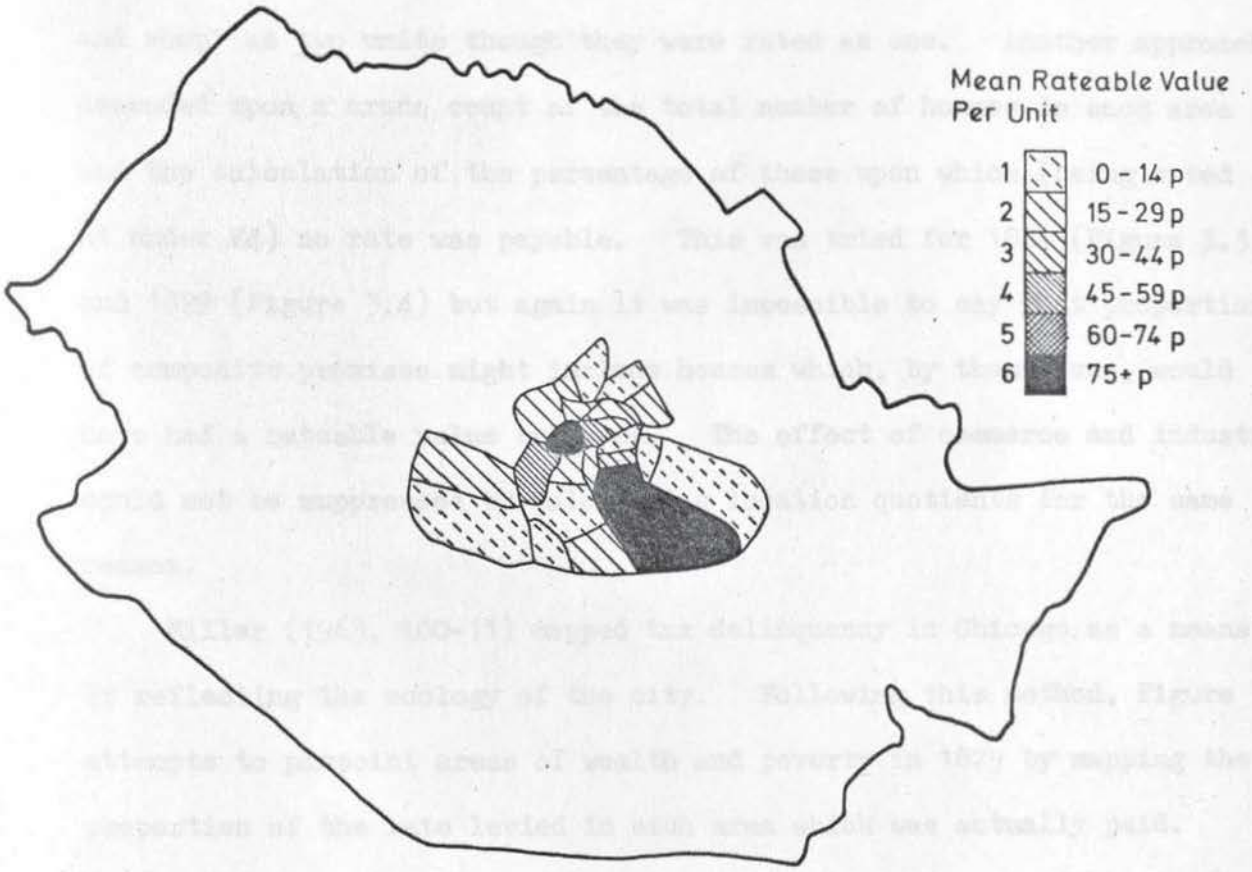


Figure 3·1: Mean Rateable Value Per Unit : Wolverhampton 1777

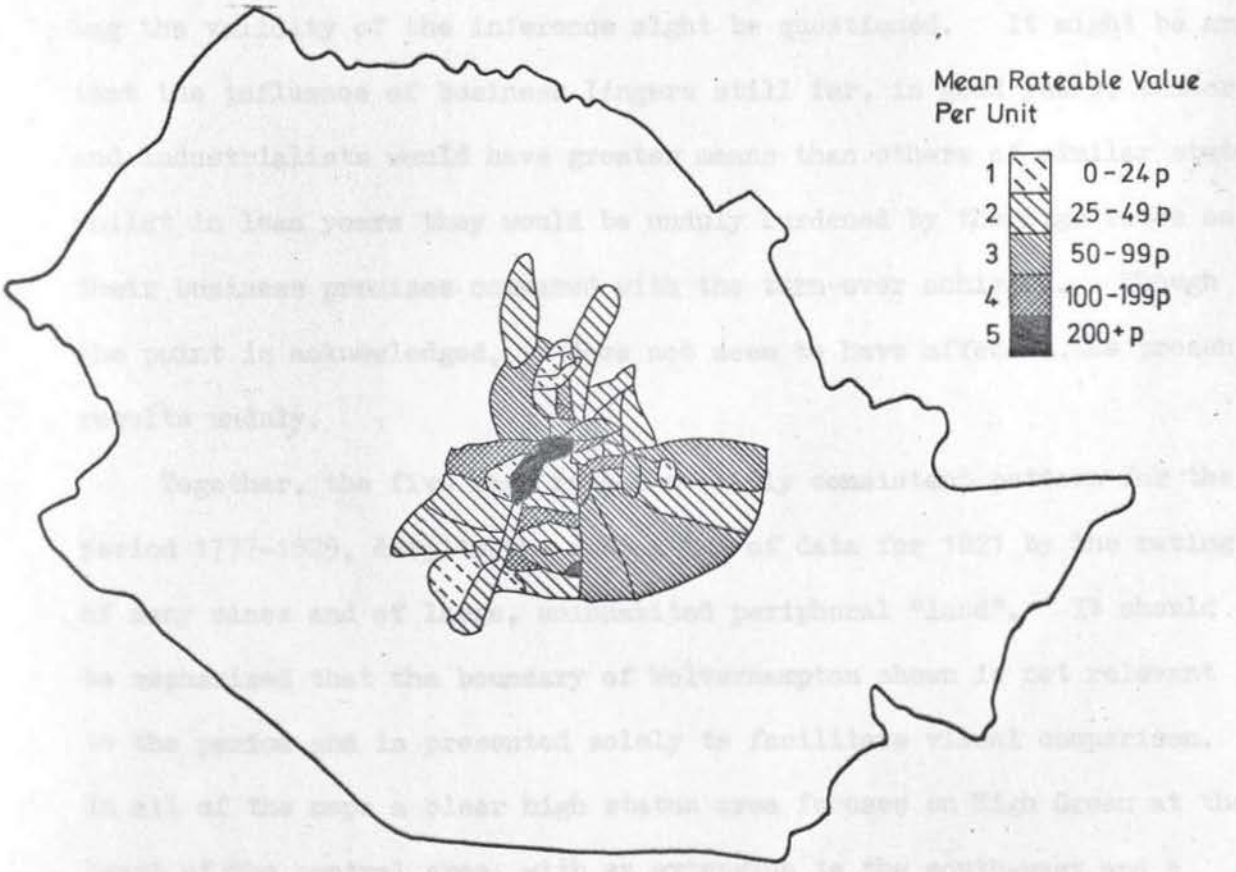


Figure 3·2: Mean Rateable Value Per Unit : Wolverhampton 1829

and shop" as two units though they were rated as one. Another approach depended upon a crude count of the total number of houses in each area and the calculation of the percentage of these upon which (being rated at under £4) no rate was payable. This was tried for 1821 (Figure 3.3) and 1829 (Figure 3.4) but again it was impossible to say what proportion of composite premises might include houses which, by themselves, would have had a rateable value below £4. The effect of commerce and industry could not be suppressed by calculating location quotients for the same reason.

Miller (1963, 100-11) mapped tax delinquency in Chicago as a means of reflecting the ecology of the city. Following this method, Figure 3.5 attempts to pinpoint areas of wealth and poverty in 1829 by mapping the proportion of the rate levied in each area which was actually paid. Phillips (1868, question 1313) stated that in Wolverhampton "the better class of ratepayers pay at once" but even allowing the forty year time lag the validity of the inference might be questioned. It might be argued that the influence of business lingers still for, in good years, traders and industrialists would have greater means than others of similar status, whilst in lean years they would be unduly burdened by the high rates on their business premises compared with the turn-over achieved. Though the point is acknowledged, it does not seem to have affected the present results unduly.

Together, the five maps reveal a fairly consistent pattern for the period 1777-1829, despite the distortion of data for 1821 by the rating of many mines and of large, uninhabited peripheral "land". It should be emphasized that the boundary of Wolverhampton shown is not relevant to the period and is presented solely to facilitate visual comparison. In all of the maps a clear high status area focuses on High Green at the heart of the central area, with an extension to the south-west and a

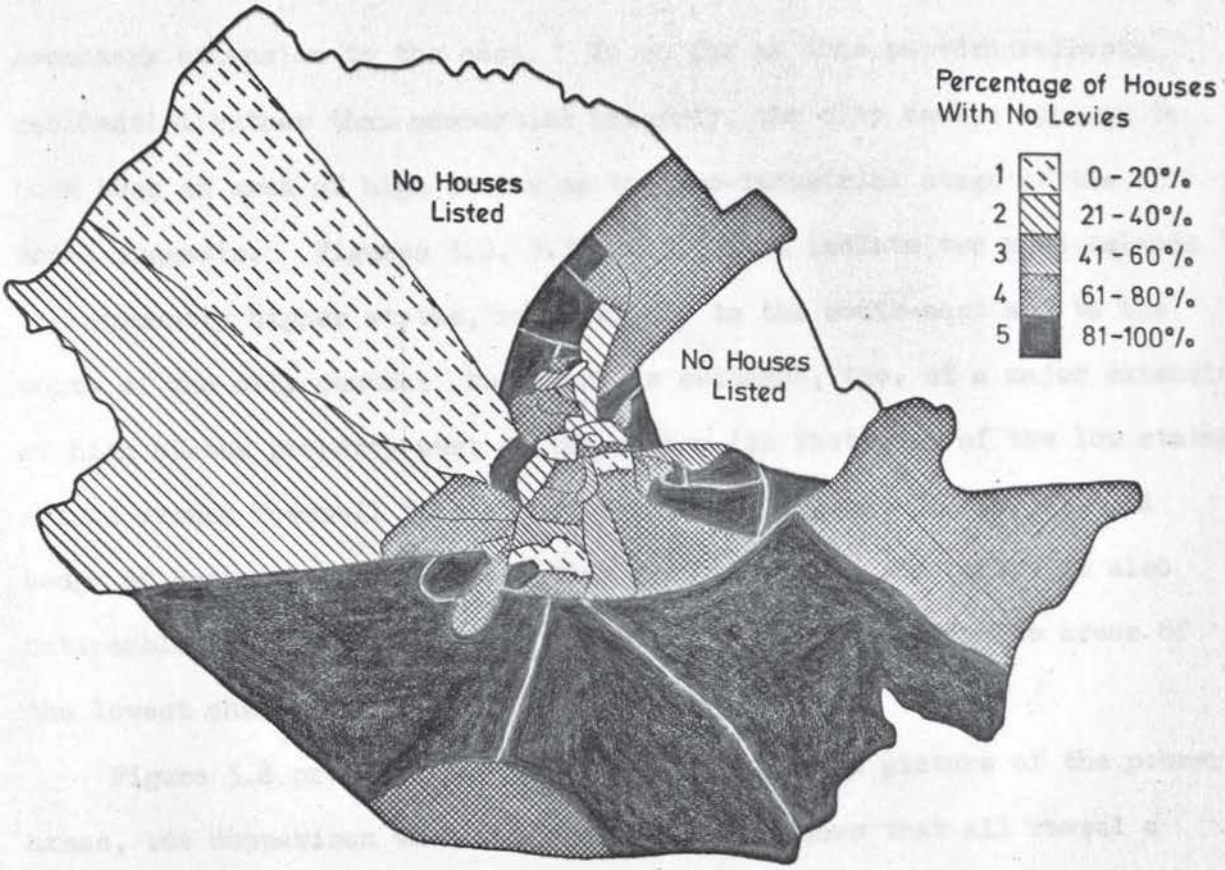


Figure 3·3: Proportion of Houses With No Levies: Wolverhampton 1821

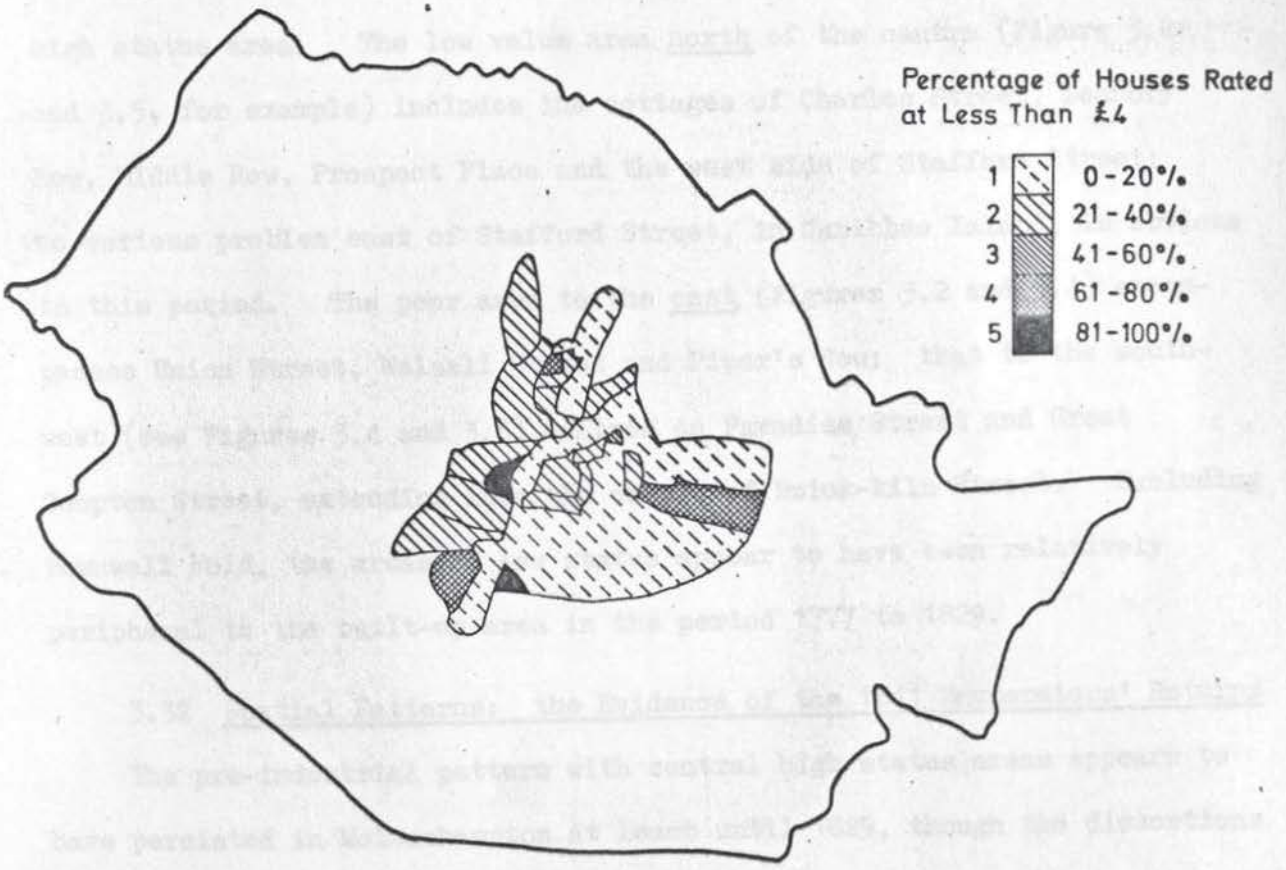


Figure 3·4: Proportion of Houses Rated at Less Than £4: Wolverhampton 1829

secondary extension to the east. In so far as this pattern reflects residential rather than commercial property, the city centre appears to have been an area of high status as the pre-industrial stage of the model suggests. Figures 3.2, 3.3 and 3.5 also isolate two more islands of apparently higher status, respectively to the south-east and to the south of the city centre; but there is evidence, too, of a major extension of high status property west of the centre (in fact west of the low status island around Townwell Fold), particularly in Figures 3.2 to 3.5. A wedge of better properties extending northward from the centre is also noticeable (Figures 3.3 to 3.5) though it passes very close to areas of the lowest character.

Figure 3.4 presents perhaps the most immediate picture of the poorer areas, but comparison with the remaining maps shows that all reveal a similar pattern. Four islands of poverty stand out. Of these, only that around Townwell Fold (west of the centre) is close to the central high status area. The low value area north of the centre (Figure 3.2 and 3.5, for example) includes the cottages of Charles Street, Deanery Row, Middle Row, Prospect Place and the west side of Stafford Street: no serious problem east of Stafford Street, in Caribbee Island, is obvious in this period. The poor area to the east (Figures 3.2 and 3.4) encompasses Union Street, Walsall Street and Piper's Row; that to the south-west (see Figures 3.4 and 3.5) centres on Paradise Street and Great Compton Street, extending into the courts of Brick-kiln Street. Excluding Townwell Fold, the areas of low status appear to have been relatively peripheral to the built-up area in the period 1777 to 1829.

3.32 Spatial Patterns: the Evidence of the 1841 Enumerators' Returns

The pre-industrial pattern with central high status areas appears to have persisted in Wolverhampton at least until 1829, though the distortions introduced by commercial and industrial rates leaves some doubt about the

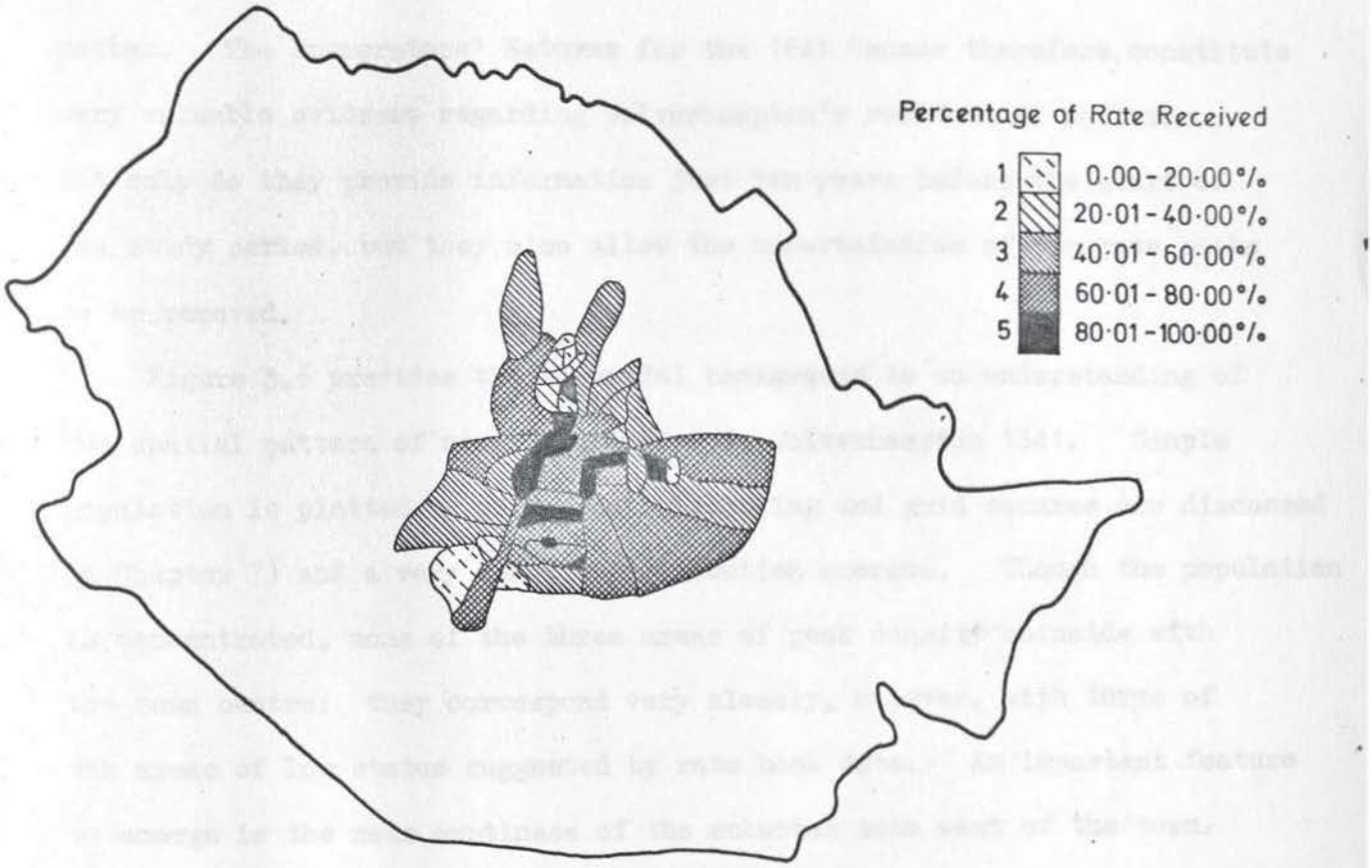


Figure 3·5 : Proportion of Rate Received : Wolverhampton 1829

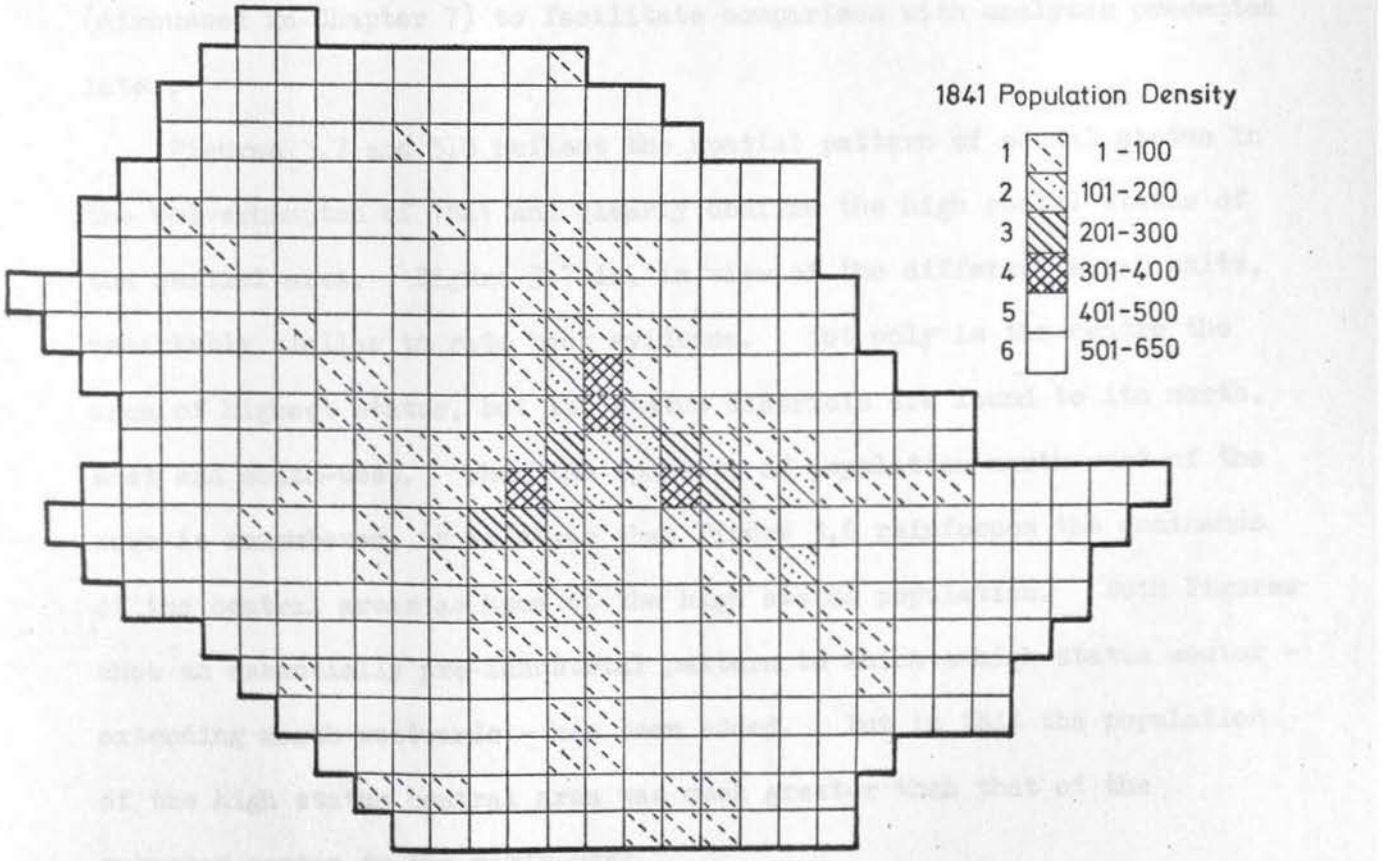


Figure 3·6 : Population Density by Grid Squares : Wolverhampton 1841

matter. The Enumerators' Returns for the 1841 Census therefore constitute very valuable evidence regarding Wolverhampton's residential patterns. Not only do they provide information just ten years before the start of the study period, but they also allow the uncertainties of the rate books to be removed.

Figure 3.6 provides the essential background to an understanding of the spatial pattern of social variables in Wolverhampton 1841. Sample population is plotted by grid square (sampling and grid squares are discussed in Chapter 7) and a very compact distribution emerges. Though the population is concentrated, none of the three areas of peak density coincide with the town centre; they correspond very closely, however, with three of the areas of low status suggested by rate book data. An important feature to emerge is the near emptiness of the suburban zone west of the town. Once the population distribution has been appreciated it is possible to consider several other census variables. These are plotted by "grid units" (discussed in Chapter 7) to facilitate comparison with analyses presented later.

Figures 3.7 and 3.8 reflect the spatial pattern of social status in the Wolverhampton of 1841 and clearly confirm the high social status of the central area. Figure 3.7 is, in view of the different areal units, remarkably similar to rate book evidence. Not only is the centre the area of highest status, but low status districts are found to its north, east and south-west. When the sparsity of population north-west of the town is remembered, it is clear that Figure 3.8 reinforces the dominance of the central areas as home of the high status population. Both Figures show an essentially pre-industrial pattern to which a high status sector - extending north-westwards - has been added. But in 1841 the population of the high status central area was much greater than that of the suburban sector to the north-west.

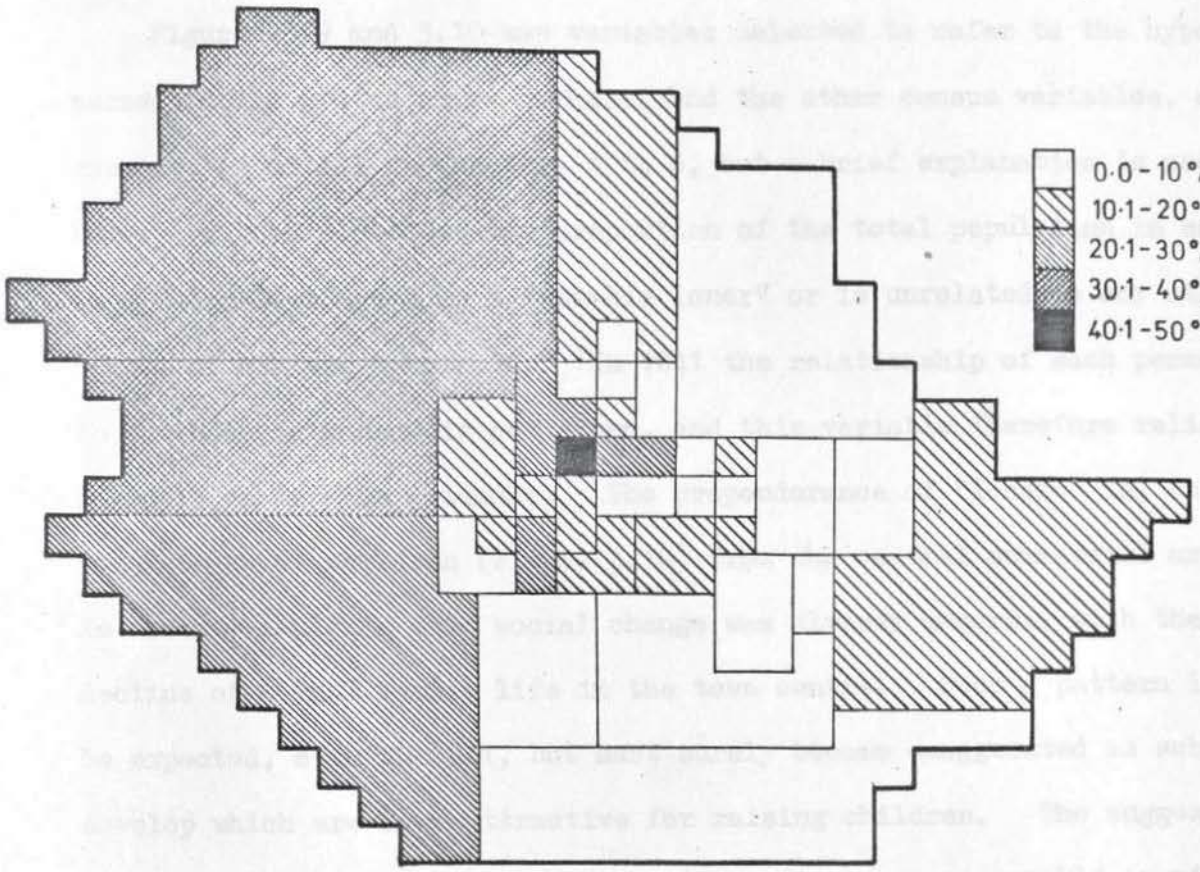


Figure 3·7: Percentage of Household Heads in Classes I and II: Wolverhampton 1841

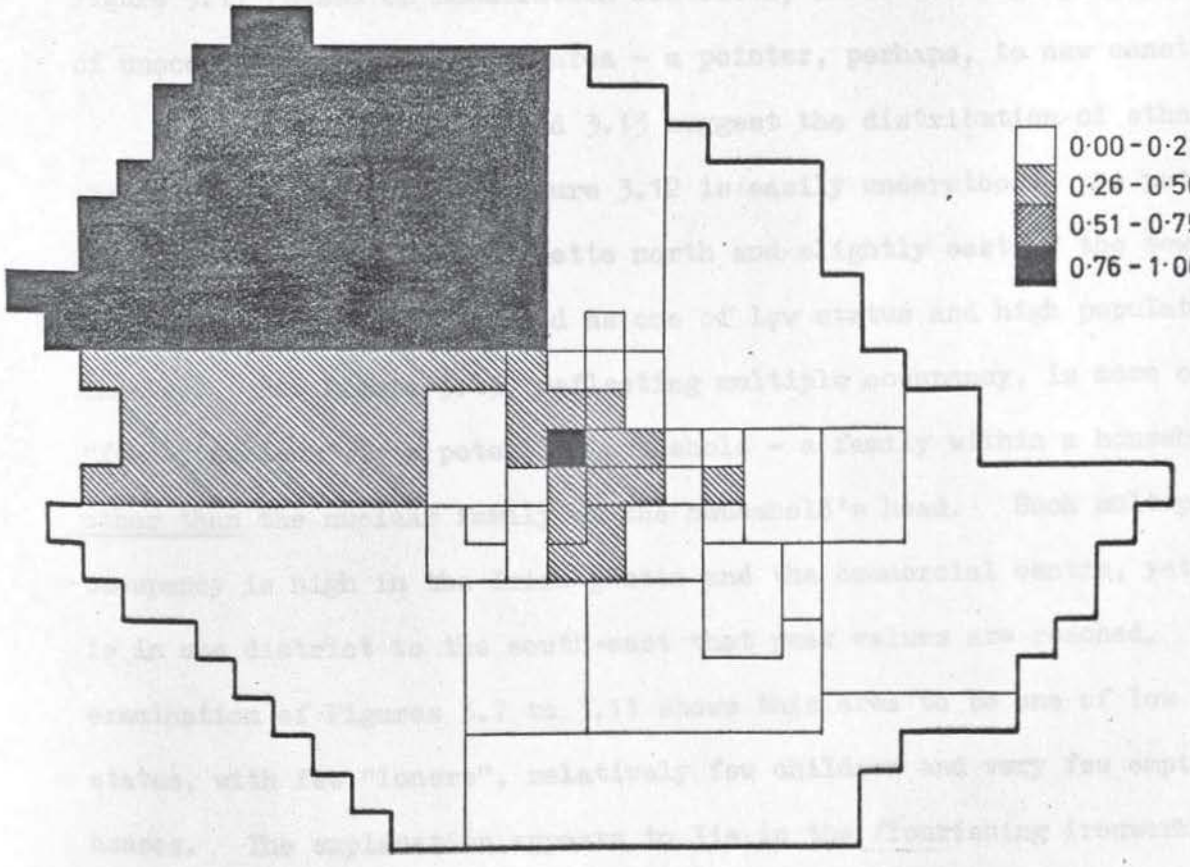


Figure 3·8: Domestic Servants per Household: Wolverhampton 1841

Figures 3.9 and 3.10 map variables selected to refer to the hypothesized family status axis. These, and the other census variables, are examined in detail in Chapters 4 to 6, but a brief explanation is necessary here. Figure 3.9 shows the proportion of the total population in each area which is classed as a "non-kin loner" or is unrelated to any other member of his/her household. In 1841 the relationship of each person to the household head is not given, and this variable therefore relies strongly on surname evidence. The preponderance of "loners" in, and the absence of children (Figure 3.10) from the central commercial area is clear - implying that social change was already underway with the decline of normal family life in the town centre. Such a pattern is to be expected, even in 1841, but must surely become exaggerated as suburbs develop which are more attractive for raising children. The suggestion that this process had already begun does not seem unreasonable in view of the high proportion of heads with children in the extreme north-west. Figure 3.11 (based on Enumeration Districts) shows the high proportion of unoccupied houses in this area - a pointer, perhaps, to new construction.

Finally, Figures 3.12 and 3.13 suggest the distribution of ethnic and migrant minorities. Figure 3.12 is easily understood; the pattern is simply that of an Irish ghetto north and slightly east of the town centre - an area already noted as one of low status and high population density. But Figure 3.13, reflecting multiple occupancy, is more complex. A "family nucleus" is a potential household - a family within a household <u>other than</u> the nuclear family of the household's head. Such multiple occupancy is high in the Irish ghetto and the commercial centre, yet it is in one district to the south-east that peak values are reached. Re-examination of Figures 3.7 to 3.11 shows this area to be one of low social status, with few "loners", relatively few children and very few empty houses. The explanation appears to lie in the flourishing ironworks,

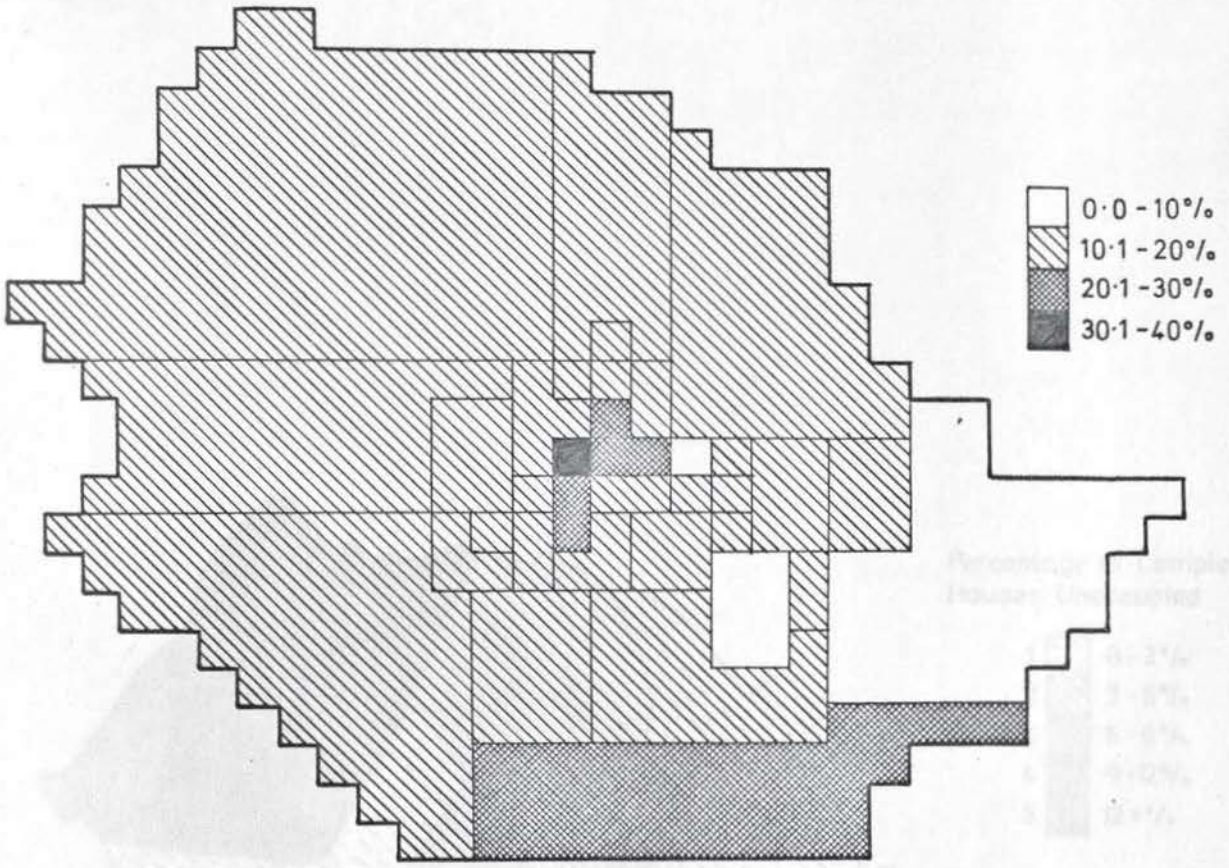


Figure 3·9: Percentage of Total Population, Nonkin Loners: Wolverhampton 1841

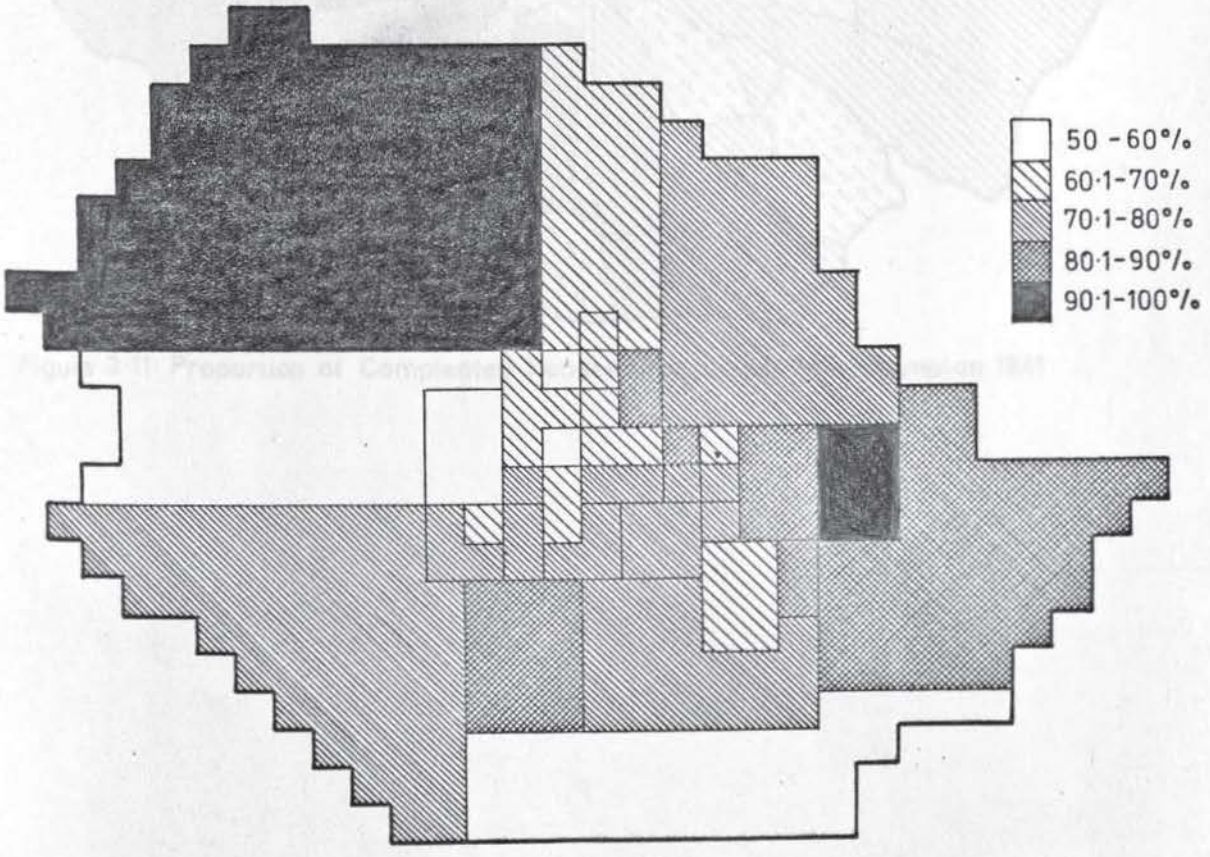


Figure 3·10: Percentage of Household Heads With Children: Wolverhampton 1841

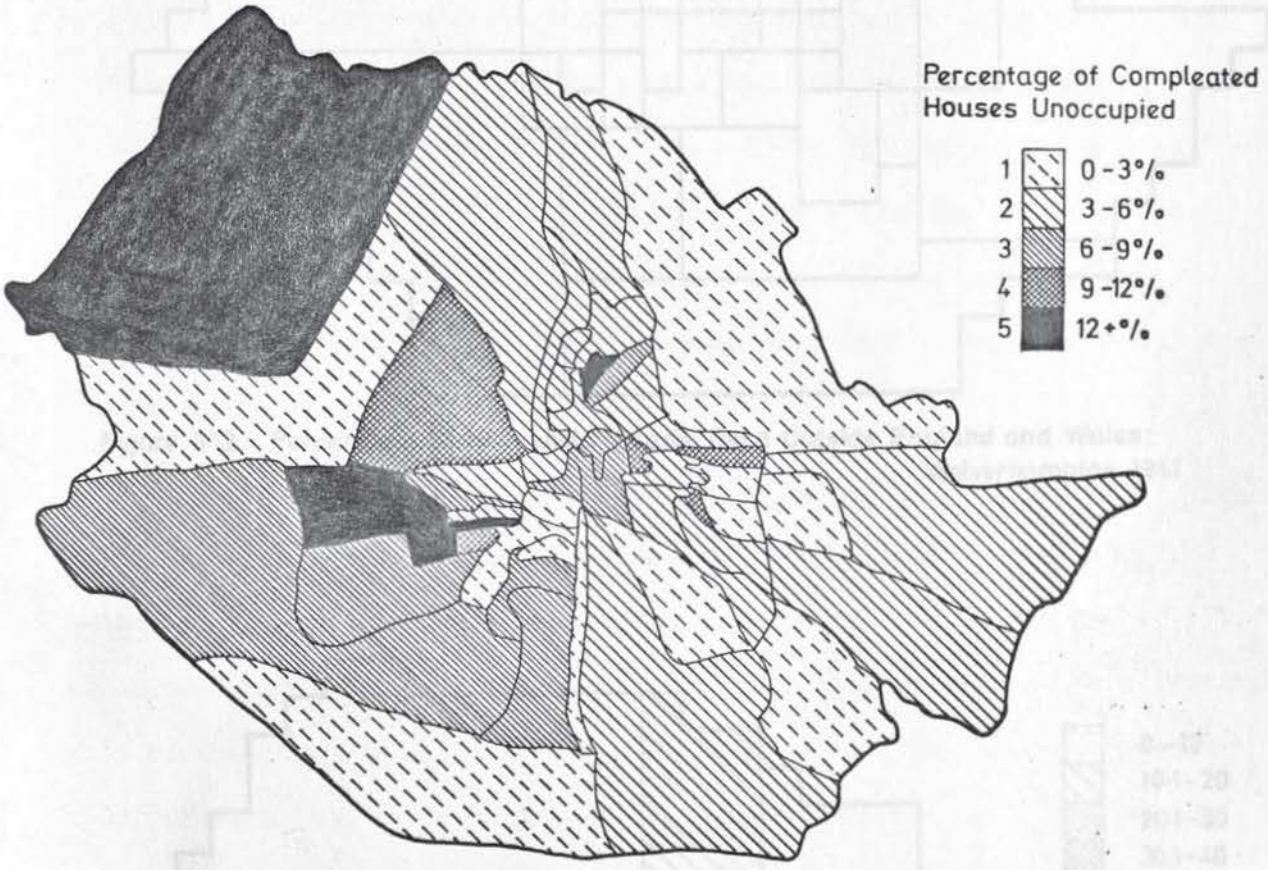


Figure 3·11: Proportion of Compleated Houses Unoccupied: Wolverhampton 1841

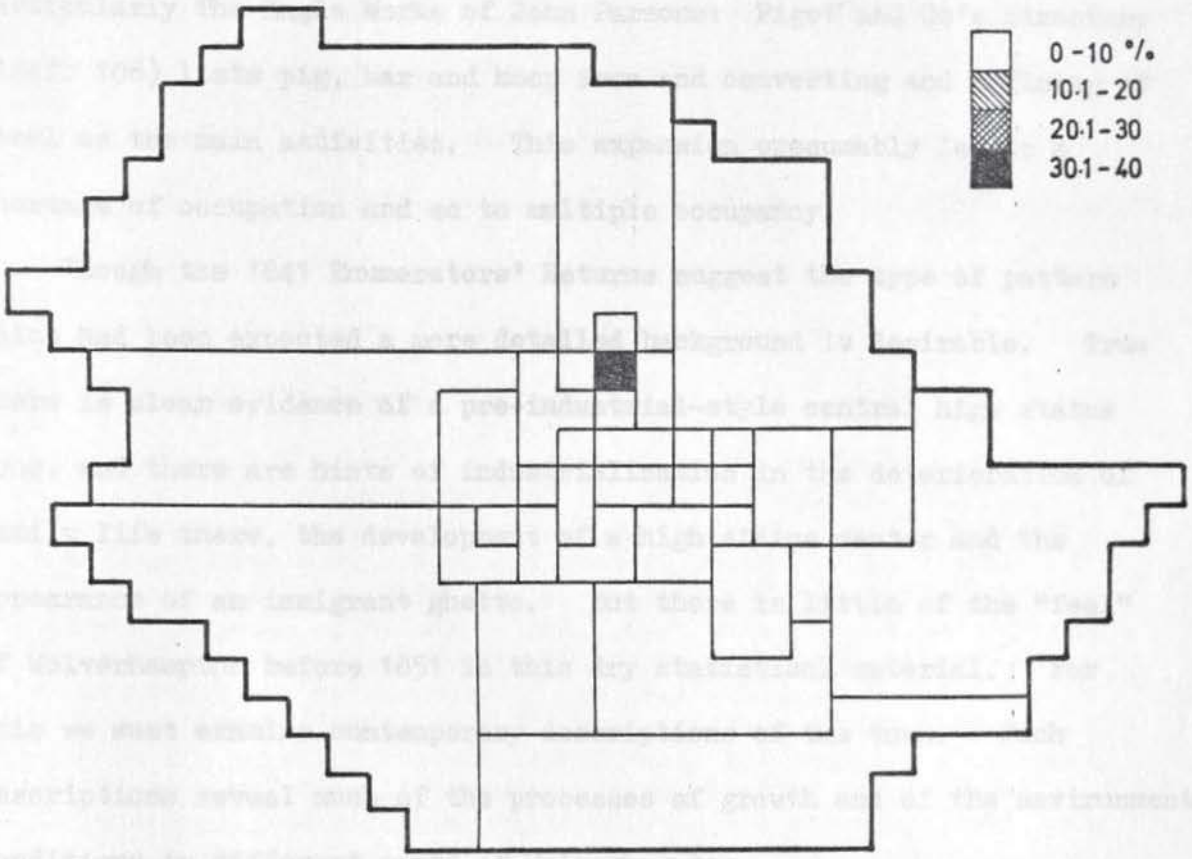


Figure 3·12: Percentage of Household Heads Born Outside England and Wales: Wolverhampton 1841

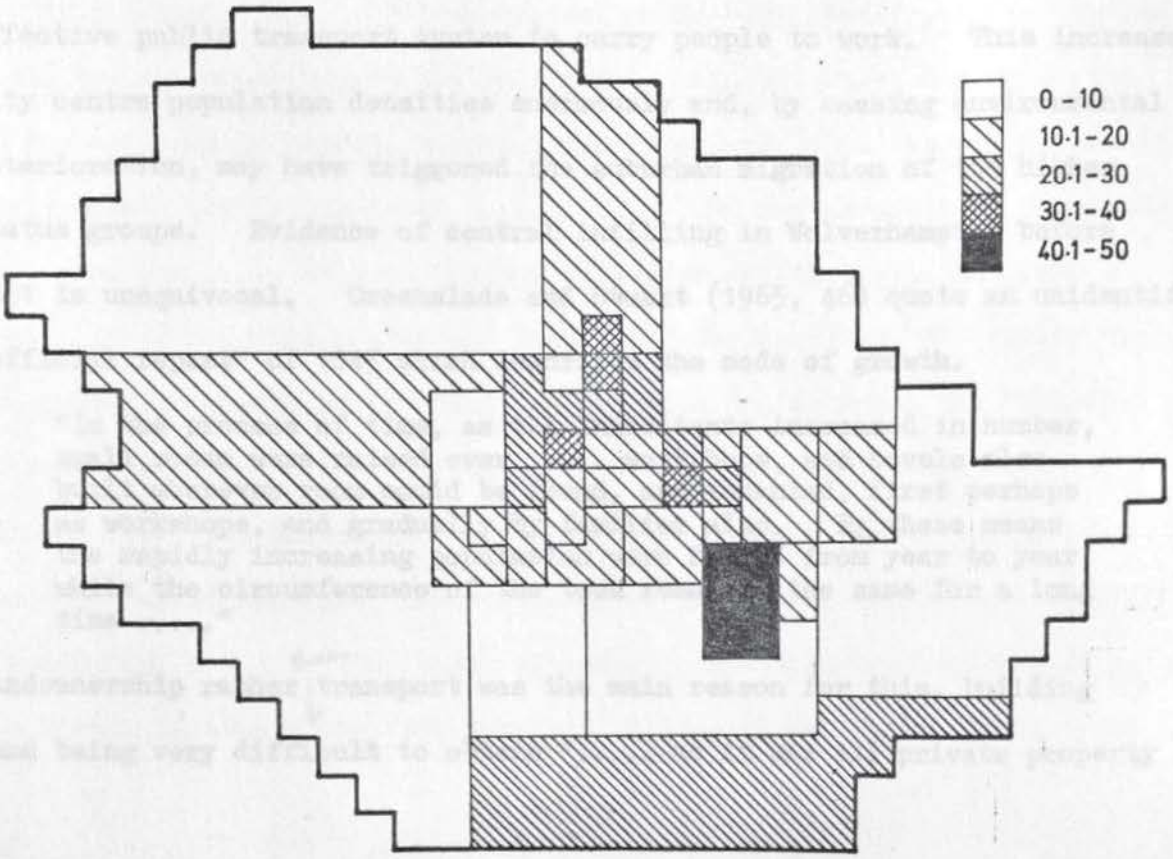


Figure 3·13: Family Nuclei per Hundred Households: Wolverhampton 1841

particularly The Eagle Works of John Parsons: Pigot and Co's Directory (1842, 106) lists pig, bar and hoop iron and converting and refining of steel as the main activities. This expansion presumably led to a shortage of occupation and so to multiple occupancy.

Though the 1841 Enumerators' Returns suggest the type of pattern which had been expected a more detailed background is desirable. True there is clear evidence of a pre-industrial-style central high status zone, and there are hints of industrialization in the deterioration of family life there, the development of a high status sector and the appearance of an immigrant ghetto. But there is little of the "feel" of Wolverhampton before 1851 in this dry statistical material. For this we must examine contemporary descriptions of the town. Such descriptions reveal much of the processes of growth and of the environmental conditions in different parts of Wolverhampton.

3.33 Descriptions of Wolverhampton Before 1851: Processes of Growth

The rapidly increasing population of the industrializing city was housed, at least in the early stages, without the advantages of an effective public transport system to carry people to work. This increased city centre population densities enormously and, by causing environmental deterioration, may have triggered the suburban migration of the higher status groups. Evidence of central infilling in Wolverhampton before 1851 is unequivocal. Greenslade and Stuart (1965, 46) quote an unidentified "official report" of 1843 which describes the mode of growth.

> "In the process of time, as the inhabitants increased in number, small rooms were raised over ..... workshops, and hovels also built wherever room could be found, and tenanted, first perhaps as workshops, and gradually by families also. By these means the rapidly increasing population were lodged from year to year, while the circumference of the town remained the same for a long time ....."

Landownership rather than transport was the main reason for this, building land being very difficult to obtain "..... as it was all private property

or belonged to the church. As soon as land was obtained Stafford Street and Walsall Street were built for the working classes, two of the longest and most disgraceful streets in the town ....."

Central plot repletion is described even more vividly by Dehane (1840), a magistrate and doctor. His words are strikingly reminiscent of Engels' castigation of nineteenth century Manchester examined in Section 2.44. Dehane described the town as follows.

> "Wolverhampton, despite its great increase in the last fifty years, retains, in the arrangement of its streets and the buildings adjoining to them, all the evils of ancient times. The main thoroughfares are narrow, and what is worse, it is in their immediate neighbourhood that close courts and alleys abound. The high price of building land, and a principle of convenience has occasioned almost every portion of the yards belonging to the houses in the vicinity of the great thoroughfares to be closely built upon, either to form workshops or small houses, which are generally let at weekly rents and occupied by workmen. A dense population is therefore congregated in these places, almost excluded from the public view, and a stranger would pass through the town with little or no idea of the immense numbers by which these precincts are inhabited. In the formation of these buildings ..... everything has been sacrificed to secure a large pecuniary return; they are ..... often of the very worst construction, and in immediate contact with extensive receptacles of manure and rubbish ... (and) many ... (have) only one privy ... for ... several families ....."

The descriptions of Wolverhampton before 1851 contain another common element: an emphasis upon the poor regard paid to public health in the matter of building layout, sewerage provision and water supply. "Should any epidemic visitation occur ..... its victims can scarcely be otherwise than numerous ..... Even in the new buildings in the town, which are generally of a humble character, regard for the health of the public does not appear to exist, particularly as respects drainage and the facility of removing refuse articles from the houses, and fever ... is constantly present ..... The deleterious effects of the various accumulations of miasmatic substances are much increased by the prevalence of pig keeping" (Dehane, op. cit.). The impact of industrialization upon the health of the people is also clear from Dehane's report, though he is reluctant to

admit the point. Accidents among miners he attributes to "inattention to their own safety" and "a desire to do their work in the shortest time", though he conceded the potential value of legislation. Dehane also stresses the influence of the habits and occupations of the large concentrated population upon its health. "The larger portion of the population is employed in the coal and ironstone mines in the neighbourhood, in the iron works, and in getting up, principally at their own residences, a variety of articles in the iron, brass and tin trades. Japanning is also carried on to a considerable extent" (ibid.). Pulmonary complaints were quite frequent but Dehane attributed this to the town's "elevated and exposed position" rather than "to any noxious effects of the occupations pursued". He believed that the abundance of fuel removed some of the causes of infection by preventing the depressing effects of cold and by promoting ventilation. Smallpox was "of frequent occurrence among the poorer classes" (ibid.) who, to a great extent, improvidently omitted vaccination.

An even more horrifying account of public health in Wolverhampton is provided by the Commissioners on the State of Large Towns and Populous Districts (First Report, 1844, Appendix 10; and Second Report, 1845, Part I, 104; and Appendix thereof, 5 and 30-1). Much of the evidence comes from answers to questions provided by J. Hill J.P. and a committee of inhabitants. Of towns larger than Wolverhampton only one (Preston) had a larger percentage increase in population between 1831 and 1841 yet there were no arrangements for water distribution there - not even standpipes for the poor. All were supplied by pumps where water was "not abundant". Nor was there a public survey of the town for the proper regulation of public or private drainage, for the information of local builders or for the regulation of new buildings. In fact there were no regulations for draining the town. Though old streets had proper inclinations for the

discharge of surface water, new streets were uneven and unpaved. There were piles of refuse, stagnant pools and open ditches next to dwellings in "some of the streets" and sewers emptied close to the town "in some instances". The absence of any "controlling power before houses are built" was to blame. Whereas the old parts of the town had sewers and branch drains, "those new streets which are composed of small houses" did not. Such houses were very deficient in the number of "proper necessaries" and they usually emptied into open ash holes: when full, ash and filth were carried out together. House drains were only cleansed by water in the best streets; elsewhere they become choked and stank. Public sewers contained wells from which sediment had, periodically, to be removed.

There were no local regulations for the systematic drainage of streets or houses, nor for repairing defective or stinking sewers. Liquid refuse lay "on the surface in the poorer streets" for courts and alleys inaccessible to the scavengers' carts and "inhabited by the poorer classes" were never cleansed. Houses were not provided with dustbins - the ash pit being used for all refuse. Town refuse removed from ash pits was deposited in "open spaces in the town not built upon". Small wonder that Wolverhmapton's relatively young population suffered a death rate for the years 1840-2 of 2.9% annually (Commissioners of Large Towns, Second Report, 1845).

Wolverhampton, therefore, grew by uncontrolled infilling in the central areas and by the development of disgraceful hovels for the working poor in the east of the town. The results of these processes form a horrible catalogue of misery and ill-health. Contemporary accounts also provide the basis for a description of conditions in the various parts of Wolverhampton.

3.34 Descriptions of Wolverhampton Before 1851: Patterns of Poverty and Disease

Dehane's report On the Sanitary Condition of the Town of Wolverhampton (1840) includes letters from the doctors in charge of each district of Wolverhampton. Their accounts of the worst areas of poverty and ill-health coincide, almost exactly, with the areas already identified as those of low social status and high population density.

Dr. Coleman lived in Salop Street (west of the centre) and provided "information ..... respecting the health and condition of the working classes in the immediate vicinity of (his) own residence" (ibid., 221) including Townwell Fold. "The district ..... contains a number of courts crowded with small and ill-ventilated tenements, the occupiers of which are chiefly employed in the manufacture of locks, bolts and hinges. They have in general a pale and unhealthy appearance, and are very subject to disease; fever, indigestion, bowel complaints and consumption, being prevalent" (ibid.). In view of the proximity of this area to high status areas (at least in 1829) Coleman's later remarks are of interest. "Between Salop-street and Darlington-street a large sewer passes, forming many open cesspools ..... When this town was visited by the cholera, it was very prevalent in this vicinity, and was indeed the only place in which any of the more respectable families were attacked by that disease - the Black Brook (as this watercourse is commonly called) passing at the back of the houses in Darlington-street where these fatal cases happened" (ibid., 221-2).

The low status area south-west of the centre bears similar examination. Dr. Cartwright attended much of west Wolverhampton "..... the most healthy ..." district in the town yet he noted "a ditch in Graisley-row, at the lower end of Brick-kiln-street and ..... another ditch in those gardens through which a passage leads from Salop-street into Brick-kiln-street ... (and) also a small pit in a field adjoining these gardens in which there is at

all times filth of a most odious nature" (ibid., 222). Dr. Gatis lived in Horseley Fields and therefore dealt with much of east Wolverhampton. In the year from Lady-day 1838 to Lady-day 1839 he had 134 cases of fever "..... out of which 49 occurred in Caribbee Isle and the adjacent courts ... In one house in Caribbee Isle I had ..... 8 cases of typhus fever at the same time" (ibid., 223). The poor state of health he attributed to the accumulation of rubbish and filth and to poverty and overcrowding, "several families residing in the same house" (ibid.). "There are also several courts ..... nearly as bad ..... Rowlison's Entry, Back Lane and the two Castle Places. ..... My attention was also directed to ..... Smithfield, Lichfield-street, Berry-street, Market-street, Wheeler's-fold, and Canal-street" (ibid.). The low values of Walsall stemmed from its development to house the working poor; typical of such areas "another great evil is its not being underdrained in Walsall-street-road ..... the roadway is always full of mud and stagnant water" (ibid.). Gatis also refers to "several new streets connecting Walsall-street with Bilston-street and Horseley-fields, where no covered drains have been formed ..... and fever is prevalent" (ibid., 224).

Finally Dr. Mason, House Surgeon to Wolverhampton Dispensary, attributed fever to the filth in "the below-mentioned localities; namely, Caribbee Islands, the small courts leading out of Stafford-street, Canal-street, Salop-street, also Duke-street, Walsall-street, Oxford-street, and the small streets leading out of Horseley-fields, the Townwell Fold, etc." (ibid.). If "the small courts leading out of Stafford-street" is taken to include Prospect Place and its surroundings to the north of the city centre, then comtemporary descriptions isolate each of the areas of apparent poverty that were identified from rate book evidence. In addition, however, Caribbee Island also formed an area of severe disadvantage by the 1840s.

3.35 Descriptions of Wolverhampton Before 1851: Poverty and the Seeds of Class Conflict

Finally, in this analysis of descriptions of Wolverhampton before 1851, it is useful to examine more general social issues for these provide a context within which changes in the industrializing city may be viewed. Two issues have been selected for particular attention: the extent of poverty, and the emergence of a self-conscious working-class movement.

A report on Wolverhampton received by the Poor Law Commissioners (1834, Appendix A, 269-70) shows that despite a well attended select vestry, a well conducted warehouse as economically run as was "consistent with the well-being of the inmates", and active overseers of good character (including one of the town's principal ironmasters "whose habits of business" and "willing devotion ... to ... his public office fit him to detect any error in the management of the poor"), despite two intelligent salaried assistant overseers, and a "perfect system of keeping the parish books", the evils of poverty were increasing in Wolverhampton. In 1824 the town's poor rate was £3,637; by 1832-3 this had risen to over £7,400. Each Tuesday the overseers were occupied from 6.30 a.m. to 2.00 p.m. with the 300 or more who received relief. Wolverhampton's answers to a questionnaire (ibid., Appendix B2, 213 f, i, j and k) were supplied by Henry Hill J.P. These show that able-bodied men were given unpleasant work before they could receive relief. Those most subject to distress were bolt, lock and latchmakers, miners and a few labourers. Given average employment conditions a worker of this type might, Hill thought, earn £26 p.a. (excluding parish relief), his wife £10, and his children under nine probably nothing; children over nine were bound out as apprentices. Though the family "might", Hill claimed, "subsist on these earnings on very ordinary food" it certainly could not lay anything by. Contemporary explanations of poverty blamed immigrants and/or strikes. Hill was unable to estimate the proportion of the labouring poor in

Wolverhampton who were non-parishioners, "there being a great number out of Shropshire, Wales, Irish and very few Scotch". He also referred to people allegedly throwing themselves out of work "because of the lowering of their wages", but industrial unrest had not then assumed serious proportions and some vagueness is understandable.

By contrast, the Midland Mining Commission's First Report (1843) followed the South Staffordshire Miners' Strike of 1842 and so sheds light on the causes and extent of dissatisfaction. Wolverhampton lay on the edge of the famous "thirty-foot" seam, and an essential adjunct to mining this coal in the 1840s was the "buttie" or middleman who organized underground work, engaged miners, provided equipment and ensured that mining proceeded quickly and (in theory) safely. Davies and Hyde (1970, 58) describe the buttie's activities as "..... like a cancer which ate at the very structure of society ....."; in the Report of the Midland Mining Commission "..... there were just as many references to the nefarious activities of the "buttie" as there were to the economic conditions which had been responsible for the strike". Mine owners, however, needed middlemen for the unpleasant task of maximizing productivity whilst minimizing wages, and to take all the abuse when trade was bad. The "buttie" got a wage, perks and was often a swindler. "The masters employ butties to get the coal; these butties employ the men and pay them as they please: they make them work half a day for a quarter's wages; the ale they give them is not fit for swine, though the master allows them 3d a quart for it" (Evidence before Midland Mining Commision, 1843, v). The butties also employed children so the Wolverhampton workhouse was almost devoid of boys (ibid., xl); this led to the 1842 Act preventing the employment of all women and boys under ten, in mines. Women and girls rarely worked underground in South Staffordshire, being mainly employed on pit banks.

The Truck system, by which the buttie paid wages at a pub, or as credit with a 'tommy shop' selling overpriced inferior goods, was rife (ibid., cxx) and the Reverend H. Pountney, incumbent of St. John's District Church, Wolverhampton with 'about 500 collier families" in his area, collected evidence (ibid., 72) showing prices were generally 20 to 30% above town prices.

Wages were low, with a "doggy" (one of the best underground jobs) earning only 3s 6d a day (ibid., Lix) and butties sent workers where colliers would not go, causing high accident and death rates, particularly in 'thick coal' areas, but even in Wolverhampton 142 miners aged over 15 were killed between July 1837 and December 1842 (ibid., lv). More detailed figures (ibid., 122) show that inclusion of miners under 15 would have raised this still further. The average age at death of miners over 15 is given as 36.3 of whom 45.7% were killed in accidents. Widowhood therefore caused a burden on poor relief, especially since fertility seems to have been extraordinarily high (ibid., 122) at over 40/1000.

Mining was seriously undercapitalized with most equipment developed for shallow pits. Equipment was poor, ventilation poor and regulation lax. (The legislation of 1854 came as signs of exhaustion appeared, and was thus rather belated.)

Such was the background to the strike of 1842. Mining depended on the iron trade, and a recession in the latter led to a fall in demand for coal. Operators therefore cut wages at only two days notice, though fourteen was customary. The miners struck and, being deemed the guilty parties, had to fend for themselves by begging (Aris's Gazette, Birmingham, 22 August 1842). Other traders and the miners' families were adversely affected and had to seek poor relief, so raising the costs of assistance and of removal to parish of origin (Davies and Hyde, 1970, 64-5). The employers tried strike-breaking tactics and this led to violence. The

miners refused to yield, selling furniture, clothes and anything else that would raise cash (Midland Mining Commission, Report 1843, xxv) so that trade at the Saturday market was poor (ibid., cxviii). The strike therefore occasioned a hardening of attitudes on both sides and certainly there was some evidence of class conflict, though ill-articulated and confused with more immediate issues. There were, apparently, no trade unions in the accepted sense, all of the societies and clubs investigated by the Commission (ibid., 1-lv) being "field clubs" which collected money to provide for miners and their families during unemployment as a result of injury.

The conclusion of the Commission's Report (ibid., cxxiv) sums up the position admirably.

> "The miners of South Staffordshire ..... are so totally uninformed about political matters ..... and their character also is so peaceable and submissive, that nothing but questions deeply affecting their domestic comforts, and strictly confined to their everyday employment, have any chance of rousing them to an open show of violence and resistance to the authorities of the country. That they have quite sufficient causes of complaint against their employers to account for their rising against them has ..... been made abundantly evident ....."

This absence of any true class consciousness amongst the working poor and the absence - despite considerable justification - of class conflict stands alongside the persistence of pre-industrial patterns in the town itself. But the seeds of change are clear in both. In the strike of 1842 there is some evidence of hardening class attitudes. In the town at the same date the inherited pre-industrial pattern was gradually being eroded by central infilling and the flight of family life for the better-off to pleasanter suburban areas.

3.36 Summary: Wolverhampton Before 1851

Throughout the period 1777 to 1841 a pre-industrial pattern, with high status residence in the city centre, persisted in Wolverhampton. Increasingly, however, signs of industrialization were becoming apparent.

Central infilling was underway and a flight of better-off families to the suburbs had begun. The old urban areas were becoming less and less healthy as uncontrolled growth of ill-planned, ill-drained and badly-built housing was crammed onto every available space. A deterioration of this type in the quality of the residential environment has already been proposed (Section 2.27) to explain the exodus of the higher status groups from the city centre as industrialization proceeds, and it is now desirable to assess the variations in the quality of the residential environment in Wolverhampton in order to assess the validity of this concept. The following Section therefore attempts to map the quality of the residential environment in mid-nineteenth century Wolverhampton. This generalized description of the spatial differentiation of the residential environment ("form") will form the basis of an assessment of the congruence between the evolving social groups and their residential neighbourhoods.

3.4 Mapping The Quality Of The Residential Environment In Nineteenth Century Wolverhampton

3.41 The Role of "Residential Environment" in an Understanding of Residential Patterns

The concept of the "residential environment" is particularly useful in an examination of the spatial form of residential patterns and of changes therein. Change in location is seen to depend firstly upon the existence of perceived incongruence between a social group and its residential environment: a social group stays put if it sees no clear reason for moving. Once incongruence has developed it may be maintained by other and over-riding advantages of the status quo. In some cases, however, the means of overcoming incongruence materialize or the incongruence grows until it outweighs the advantages of the status quo, and the move follows (cf. Wolpert, 1966, who sees migration as an adjustment to environmental stress).

Perceived incongruence may arise from many causes. In the industrializing city environmental deterioration may have led to a change in preferences amongst the upper status groups, who were then gradually released from the central area by rising commercial land values and the improvement of public transport. Another important cause of residential relocation, particularly amongst manufacturers in the early stages of industrialization, may have been the decline of domestically organized economic activity. Perceived incongruence may have existed for some time, suppressed by the fact that home and workplace were one. But once home and workplace were physically separated there was no reason why residence in another part of the city should not be contemplated if the advantages were thought to outweigh the added costs. Immediately some saw their environment as incongruent with their aspirations and, having the means, moved house. Residential differentiation along socio-economic lines began to emerge since, for others the possibility of movement was small: the low status family man would remain in the slums until transport improvements and local authority rehousing permitted a pleasanter environment for raising children. Vance (1967, 126) develops a similar argument.

> "The substitution of a general supply of housing ... for the clearly specified units built by employers for their workers ..... could be expected to lead quickly to the emergence of a new dynamic. With occupation ties dropped ..... the seeker after housing came to use new criteria of choice. These may be summarized as economic and social stratification. But it seems that a geographical caste system may be the more ultimate outcome of the new dynamic than the conscious desire of those involved. Specifically, what seems to have entered into housing provision with the generalization of supply in the middle of the last century was the introduction of the concept of <u>environment</u> into the minds of the searchers. Wherever man had lived he had been attended by an environment but until his choice of residence became wide and geographically permissive his opportunity to create a diversity of environments was small."

Greater freedom of residential location led to the development of what Brown and Moore (1970) call an 'aspiration region'. The result was suburbanization (Lawton, 1972, 213) reflecting the new preferences and

possibilities regarding environments to live in. With this in mind it is necessary to consider the ways in which the "residential environment" may be recreated for a nineteenth century city.

3.42 Factors Differentiating Residential Space in Nineteenth Century Wolverhampton

Some of the factors responsible for differentiating urban residential space have already been considered (Section 2.2) but it remains to examine the likely importance of each of these in Wolverhampton up to 1871.

The site covered by the town contained considerable variation in relief, so that natural physical characteristics may have had an important role in shaping its residential form. Similarly, the pattern of pre-existing land uses is likely to have been very influential. Regarding the role of transport, however, there is room for more doubt. Even in 1871, Wolverhampton was relatively small in total extent and walking was still possible for most likely journeys. The localization of mining and of iron industries may also have reduced travel to work. Moreover, the introduction of the tram post-dates the study period (Avery, 1948) and though there had been private horse buses since the 1850s, available directory evidence suggests they were infrequent and started too late for travel to work. Towards the end of the period there was an increase in activity, but many of the services still operated only three days weekly and would not have supported daily commuting. Transport was limited, and private arrangements - augmented by a few small scale operators - dominated the scene. Railway development largely pre-dates the study period (Clinker, 1954; Avery, 1948) so that resultant demolitions had already occurred. The major effect of the railway was as an undesirable land use, but this may be treated as an element of the pattern of pre-existing land uses. It was decided, therefore, that the role of transport did not warrant separate attention.

It is clear, from evidence already examined, that landownership had an important impact on the environmental character of different parts of Wolverhampton. But evidence is difficult to obtain, and the pattern was broadly shaped prior to 1851. The major effect of landownership was in increasing the density of established areas for development, and this type of influence is incorporated within the pattern of pre-existing land uses. So too is the effect of the local building industry in differentiating the urban residential environment. The present process-function approach requires no very detailed explanation of form, and the land use pattern provides a useful summary of the various types of residential neighbourhood. Such treatment adequately captures the limited impact of local government control and intervention. The Town Commissioners had been put in charge of streets, public buildings and removal of nuisances as early as 1777 (Jones, 1903, 5-7). In 1820 they concluded an agreement with Lord Darlington to purchase certain garden ground, and as a result the Commissioners cut a new, wide, straight street from the market-place to Chapel Ash (Darlington Street) so that local authority influence was not wholly absent (ibid., 14-17) but helped shape the land use pattern inherited in 1851. Unpublished minutes show several minor demolitions were also effected. The entry for Friday 2nd February 1844, for example, includes the words, "Houses at the bottom of Canal Street are bought for £75 and the site thrown into the street" (Town Commissioners, 1777-1848, 51). Generally, however, the Commissioners were ineffectual, improving frontages along major thoroughfares but content with resolutions about the real problems. Even in June 1847 "Caribbee Island, Back Lane, Coles Croft and Castle Place" were "nuisances, and must be abated" (ibid., 56). The Commissioners were replaced by the Council which was also responsible for certain demolition, but the first housing scheme dates only from 1881 when, under the 1875 Artisan's and Labourers' Dwellings Improvement Act,

16 acres around Lichfield Street was demolished for road realignment and tenants rehoused (Avery, 1948, 80). Hence major public action post-dated the study period, while more modest work merely modified the precise land use pattern. Establishment of the existing pattern of land uses was clearly the major task underlying a summary of the types of residential environment available in nineteenth century Wolverhampton.

3.43 Mapping the Residential Environment of Nineteenth Century Wolverhampton

Low (1891) describes the shift of his Victorian contemporaries to the suburbs with a clear distaste for the crowded city and its slums. A preference for high, well-drained sites far from "undesirable" land uses has already been noted. Establishing that a similar pattern operated in nineteenth century Wolverhampton demanded a large amount of information about the town in that period. The underlying aim was not to use both physical and social criteria to derive 'natural areas' as does Davie (1938) in New Haven, but to map the purely physical environment. Similar work has been attempted by Beynon (1937) and by Bardet (1951) who used the term 'social topography' to refer to the information he was mapping. Here the problem was compounded by the historical nature of the inquiry: features relevant within a nineteenth century preference system had to be accurately portrayed from available evidence. Verbal information was insufficient to describe the spatial pattern and it was necessary to investigate many alternative sources before an acceptable approximation was obtained. A modern contour map provided information regarding relief and drainage, but evidence about mid-nineteenth century Wolverhampton proved problematic. No rating list covered the period, and no use of directory evidence could be contemplated; the census and historical maps thus constituted the only hopes of success.

The census provided several tempting items of information which might be used to suggest a spatial pattern. Firstly there were data

regarding the number of houses which were 'occupied', 'unoccupied' and 'building' (i.e. under construction). It proved very difficult to allocate houses which were building (and sometimes those which were unoccupied too) to grid squares because addresses were often absent for such property and many enumerators clearly omitted some of the property under construction in their districts from the main body of the returns - listing several houses which were 'building' at the end of the book. This practice was confirmed in cases where addresses were given, but often occurred without any information suggesting the grid square to which the houses belonged. Hence the most detailed level on which mapping could be attempted was that of the Enumeration District. Experiment revealed that the ratio of unoccupied to occupied houses alone merited attention. The number of houses under construction at any one time was very small and the ratio that this formed of the total was very variable; another means of assessing house building seemed desirable.

Unfortunately Enumeration District (ED) boundaries varied between censuses so that total numbers of (occupied and unoccupied) houses could not be compared directly. Aggregation to wards, however, did offer comparibility, for 1851, 1861 and 1871 ED boundaries respected the unchanging ward boundary pattern. Careful subdivision of problem districts yielded comparable ward data for 1841. With the number of completed houses in each ward known for 1841, 1851, 1861 and 1871 net intercensal change was calculated to outline the chronology of residential expansion in different parts of the city. By assuming that no house built after 1841 was demolished before 1871 it was possible to estimate the minimum proportion of all houses standing in a ward in 1871 which must have been less than 10, 20 and 30 years old. This showed where the 'new' houses were located in 1871 - an important aspect of environmental differentiation.

The census returns also contained many entries which permitted courts, yards and allies to be identified but attempts to use this floundered

because of the inconsistency of the different enumerators. It was also felt that cartographic evidence was likely to prove more rewarding. Several maps were available from the period 1851 to 1871. The best was that produced under the 1848 Health of Towns Act in 1852 but there were several holes in the only known original copy (held by the British Museum). Several areas of Wolverhampton's facsimile had begun to deteriorate, but the Reference Library would only permit photocopying in small A4 sections; reassembly of these small pages to form each sheet was contemplated but the holes - faithfully reproduced from the original - posed a serious problem. An alternative map was complete, and available in a sturdy original; at a scale of 26 inches to the mile, it was the work of the local lithographers Steen and Blacket (1871). Since there was clearly insufficient evidence for a separate map of the residential environment for each census, the date was seen as a positive advantage. By concentrating on the residential environment in 1871 it was possible to indicate something of the development involved up to that date.

Examination of the sheets showed that surveying must have occupied several months, at least, for a new street at one sheet edge did not find its continuation on the next. Comparison with the more detailed map of 1852 allowed the merits of the plan to be assessed. It became clear that building outlines were reliable and analysis of housing types was thought feasible. The earlier map contained information regarding the use of buildings, and this suggested that industrial building could be identified by their size and shape where they were not labelled in 1871. The map of that date, it appeared, indicated public buildings, churches and similar abnormally large premises leaving only factories and warehouses without clear description (though the largest ones were named).

Two analyses were undertaken. Housing (including shops in the central area) was allocated to one of four categories based on size and shape and the proportion of each type calculated by grid square. The

contrast between small, mean terraces and large detached and semi-detached housing was clear, and two intermediate types were also identified. Together with the census data regarding the location of 'new' housing, this analysis of variations in housing type offered a real basis for characterizing the residential character of different areas. In addition, industrial-type buildings were counted by grid square. This second analysis proved misleading; a large iron works covering several grid squares was counted only once in each square, so that a wholly industrial sector was attributed but a single factory, while a dominantly residential area might contain ten separate factories. Finally, presence or absence of 'industrial-type' premises by grid square was adopted as an acceptable compromise.

This 'industrial-type' use was not, of course, the only identifiable "undesirable" land use. Presence or absence of railways, canals and of mining or derelict workings was recorded too. The presence or absence of farmland and of parks was also noted, as was the extent of the built-up area - though this latter proved virtually worthless. Nevertheless, with information on the age and type of housing, the proximity of industry, railway lines, canals, mine workings, farmland and of parks it was possible to attempt a description of the residential environment in Wolverhampton in 1871. Though this falls short of the ideal, with data for each census in turn, it provides a far more complete picture of nineteenth century residential differentiation than a factorial ecology of social variables alone.

3.5 The Quality Of The Residential Environment In Nineteenth Century Wolverhampton

3.51 The Natural Physical Environment

In 1817 Pitt noted (1817, 167) that "Wolverhampton stands on a rising ground"; though Figure 3.14 confirms this, the extension of the centre

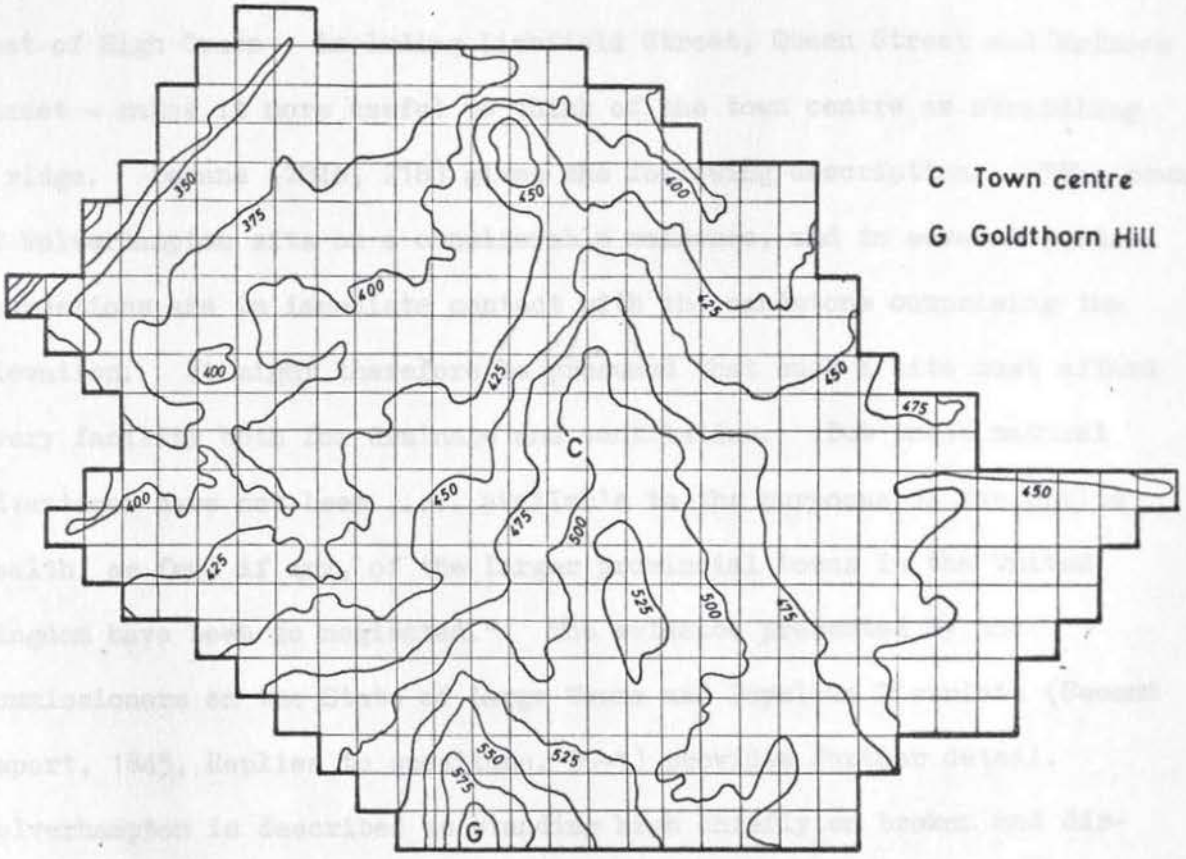


Figure 3·14: Wolverhampton: Relief

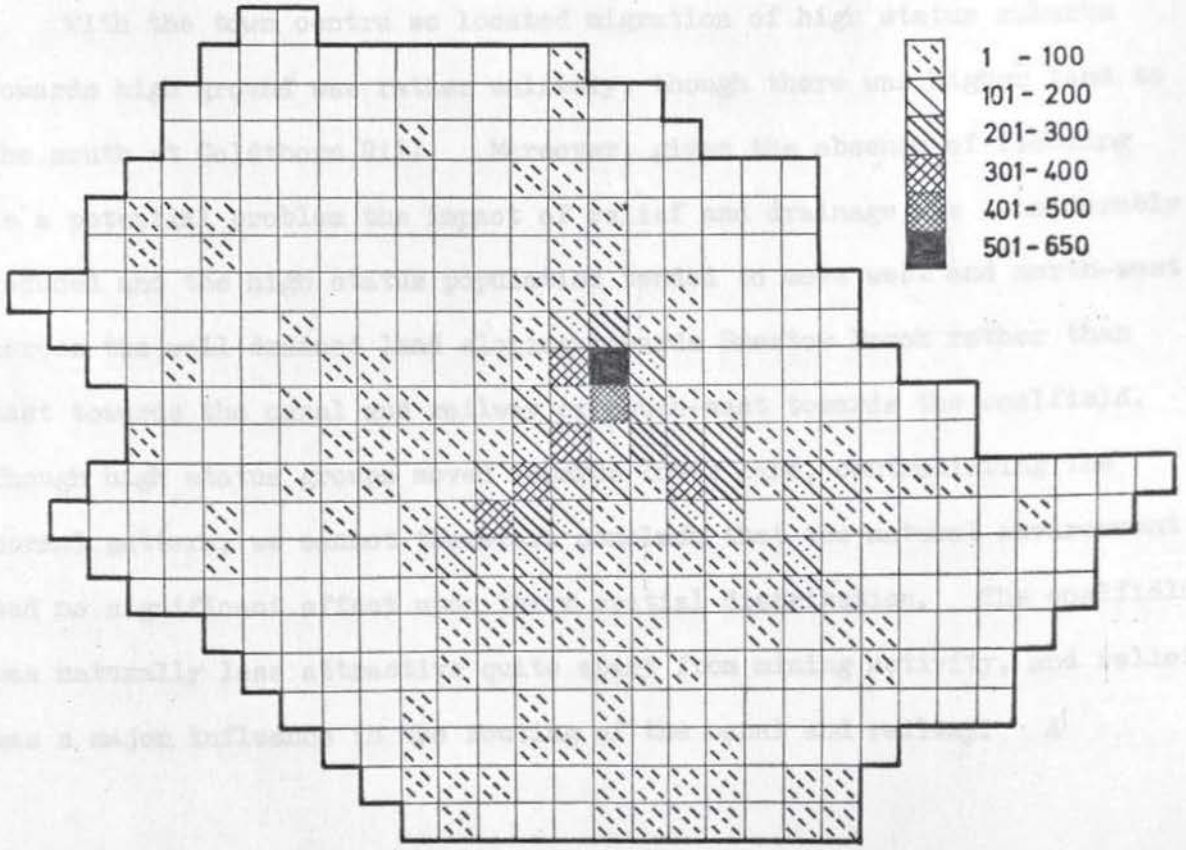


Figure 3·15: Population Density by Grid Squares: Wolverhampton 1851

east of High Green - including Lichfield Street, Queen Street and Princes Street - makes it more useful to think of the town centre as straddling a ridge. Dehane (1840, 218) gives the following description. "The town of Wolverhampton sits on a considerable eminence, and in several parts foundations are in immediate contact with the sandstone comprising the elevation. It might therefore be presumed that such a site must afford every facility both for drainage and ventilation. But these natural advantages have not been ..... available to the purposes of the public health, as few, if any, of the larger provincial towns in the United Kingdom have been so neglected." The evidence presented by the Commissioners on the State of Large Towns and Populous Districts (Second Report, 1845, Replies to questions, 30-1) provides further detail. Wolverhampton is described as standing high chiefly on broken and dislocated new red sandstone with the Staffordshire coalfield to the south and east. Canals locked downwards towards the neighbouring rivers, the town was definitely not liable to flooding and there were no obstructions to natural drainage.

With the town centre so located migration of high status suburbs towards high ground was rather unlikely, though there was higher land to the south at Goldthorn Hill. Moreover, given the absence of flooding as a potential problem the impact of relief and drainage was considerably reduced and the high status population tended to move west and north-west across the well-drained land sloping towards Smestow Brook rather than east towards the canal and railway or south-east towards the coalfield. Though high status groups moved towards lower land, contradicting the normal pattern, we cannot therefore conclude that the natural environment had no significant effect upon their spatial distribution. The coalfield was naturally less attractive quite apart from mining activity, and relief was a major influence in the routing of the canal and railway. A

contemporary view of the area is provided by the Post Office Directory (Kelly's, 1860, 721).

> "The soil on the west and north of the town is rich and fertile; but on the south and east there is a continued extent of coal and iron mines, in some places the coal cropping out to the surface ... and ... the ... whole of the district ... is worked for coal and ironstone ....."

3.52 Spatial Variations in the Character of Housing

Of the existing land uses in the town, variations in housing obviously had greatest impact upon the residential environment of different districts. Density, age and type of housing may all be examined.

Figures 3.15 to 3.17 show the population density by grid square within Wolverhampton for 1851, 1861 and 1871. Comparison of Figure 3.6 (for 1841) with Figure 3.15 (for 1851) reveals a very substantial increase in residential densities over much of the central built-up area, though the four areas of lowest social status remained the most densely populated parts of the city. Compared with 1841, a slight suburban expansion was evident by 1851. This was even more marked by 1861 (Figure 3.16), and by 1871 (Figure 3.17) suburban growth to the north-west of the town covered an extensive area at moderate to low densities. Comparison of 1851 (Figure 3.15) and 1871 (Figure 3.17) also suggests a decline in densities in the old central built-up area - though again the four areas of poverty remained the most densely populated parts of Wolverhampton.

Figures 3.18 and 3.19 isolate the types of changes involved. The former shows the change in sample population of each grid square between 1841 and 1851; the pattern is mainly one of substantial increases, and the centre and east of the town are well represented. The latter covers the period 1861 to 1871 and a totally different pattern emerges. Decreases dominate the central section, with increases particularly in the north-west. This confirms the flight from the crowded central areas and the establishment of lower density suburbs suggested by Figures 3.15 to 3.17 (cf. Lawton,

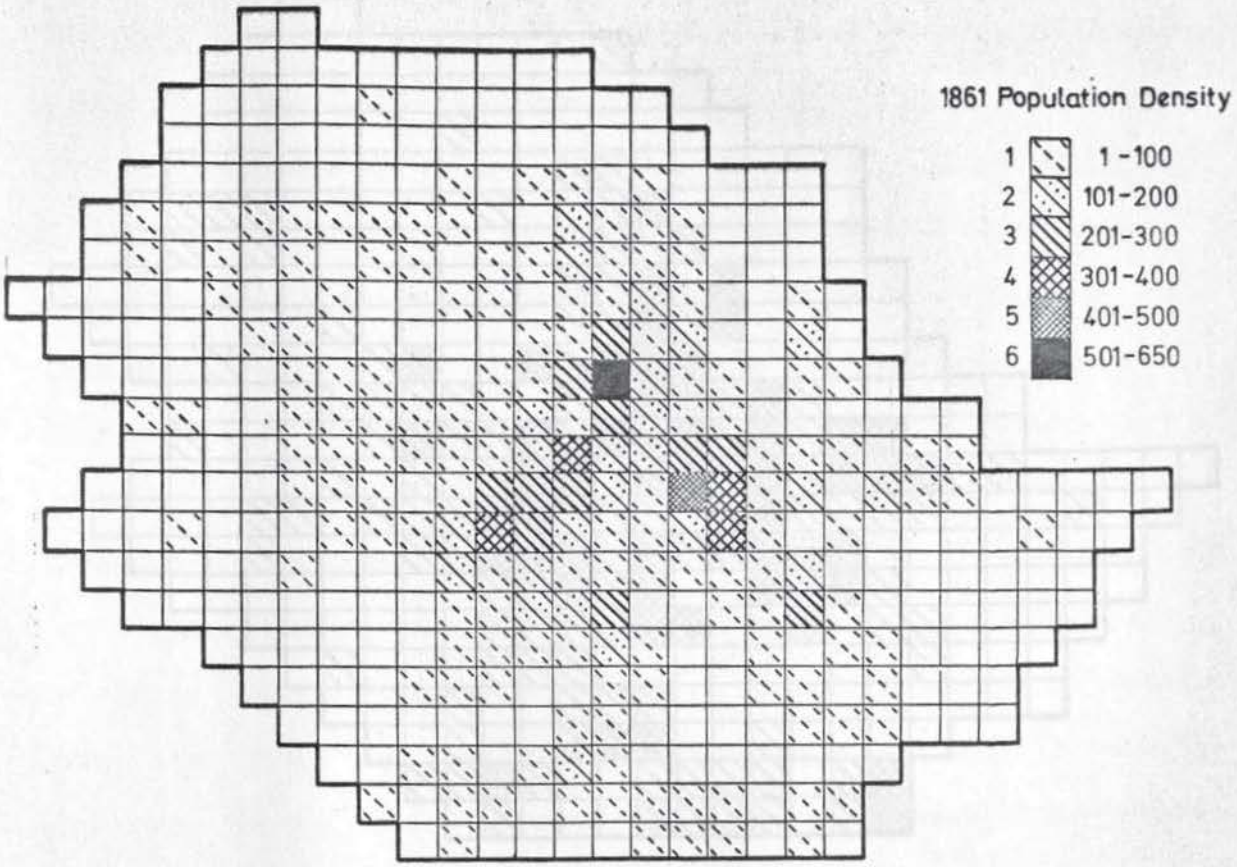


Figure 3·16: Population Density by Grid Squares: Wolverhampton 1861

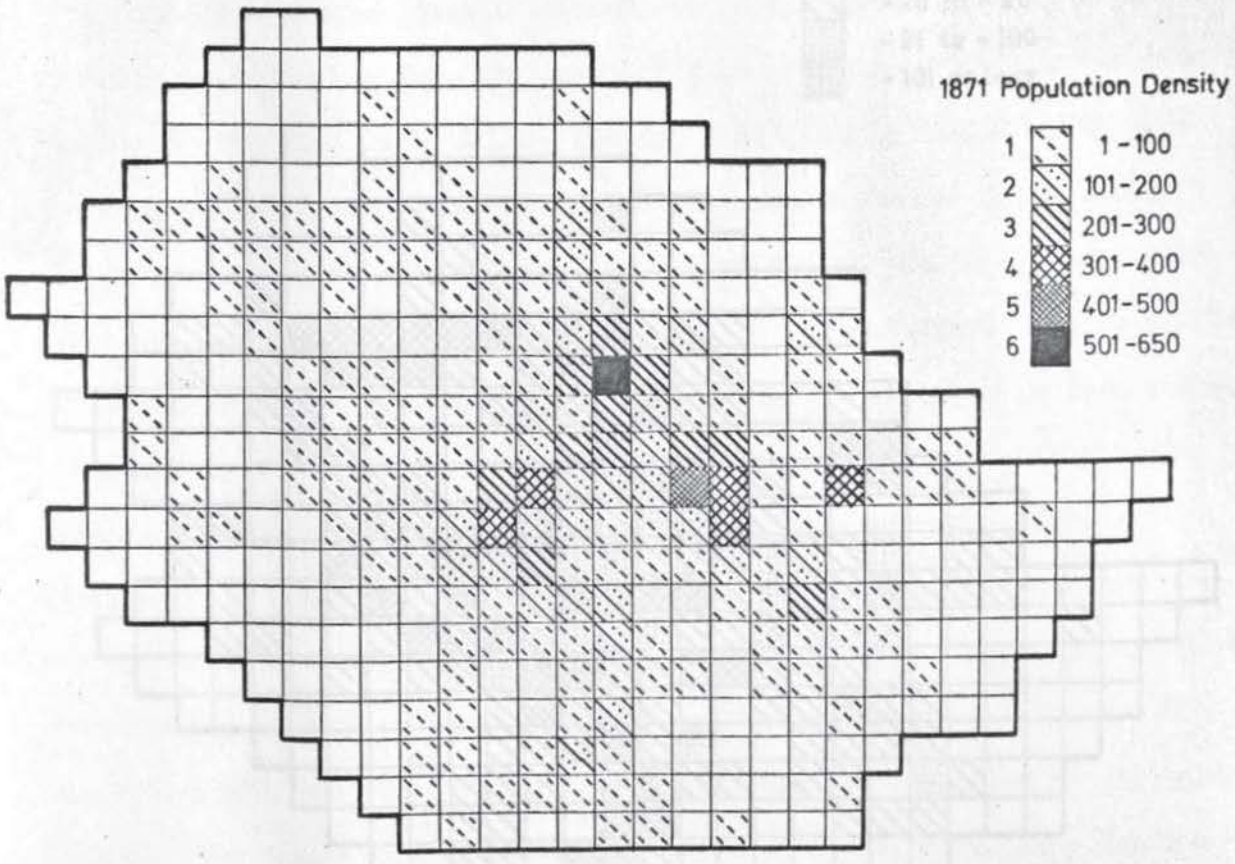


Figure 3·17: Population Density by Grid Squares: Wolverhampton 1871

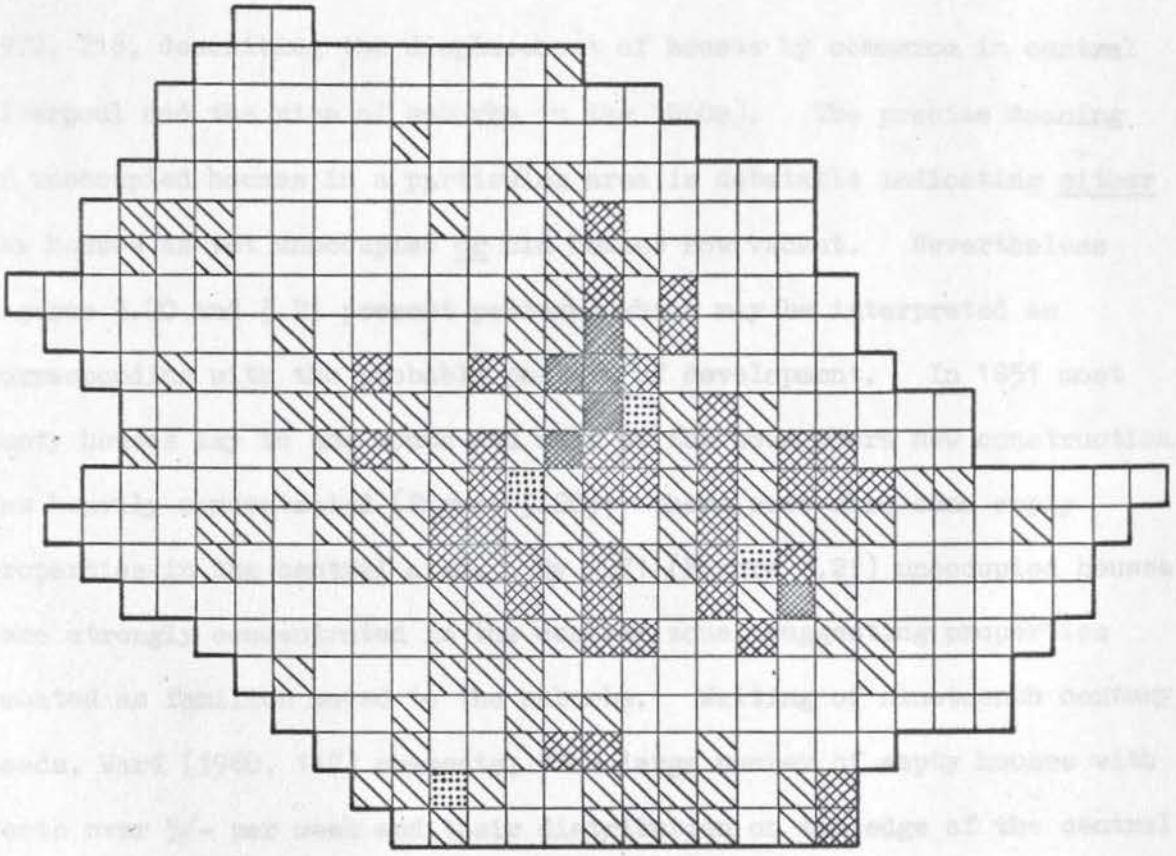
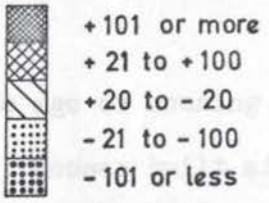


Figure 3·18: Population Change: 1841-1851



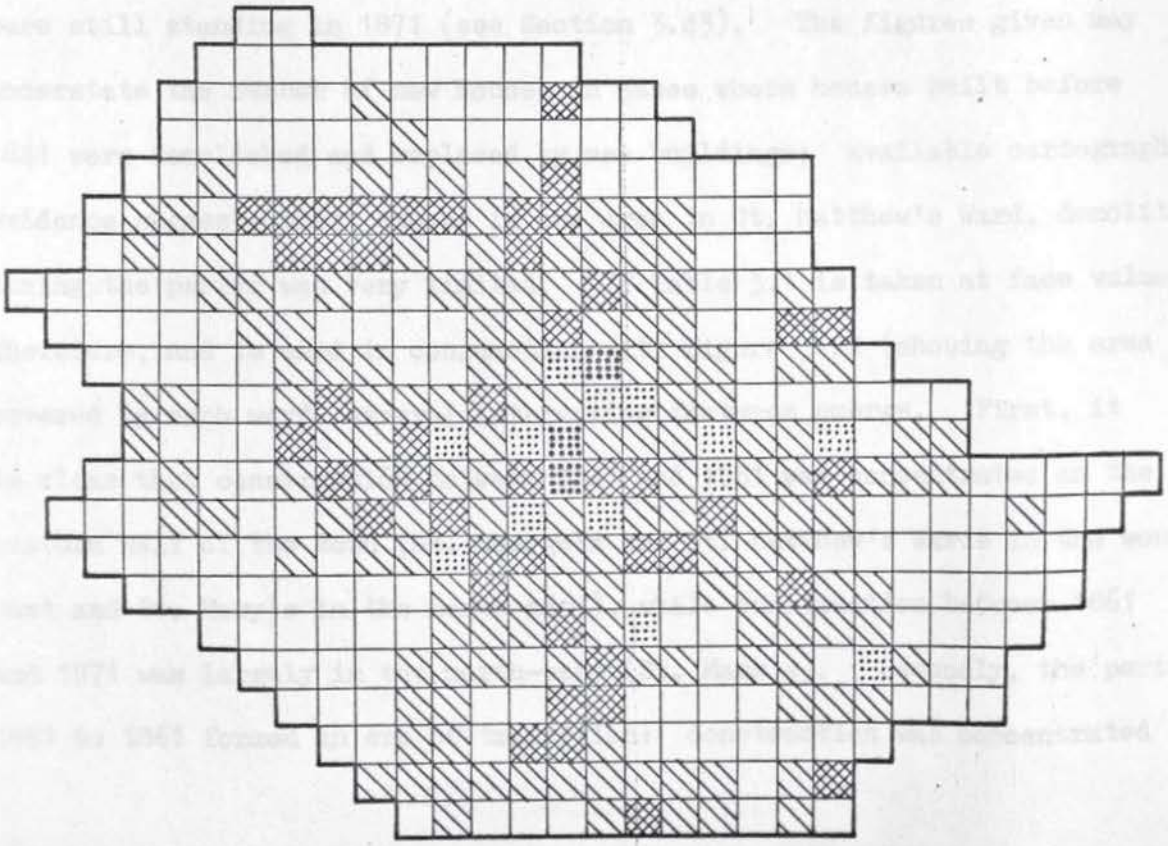


Figure 3·19: Population Change: 1861-1871

1972, 216, describing the displacement of houses by commerce in central Liverpool and the rise of suburbs in the 1860s). The precise meaning of unoccupied houses in a particular area is debatable indicating either new houses as yet unoccupied or old houses now vacant. Nevertheless Figures 3.20 and 3.21 present patterns which may be interpreted as corresponding with the probably pattern of development. In 1851 most empty houses lay to the south and east of the town where new construction was heavily concentrated (Figure 3.20); there were also some empty properties in the central area. By 1871 (Figure 3.21) unoccupied houses were strongly concentrated in the central zone, suggesting properties vacated as families moved to the suburbs. Writing of nineteenth century Leeds, Ward (1960, 117) comments, "The large number of empty houses with rents over 5/- per week and their distribution on the edge of the central built-up area probably reflects the move of the better paid artisans to the outskirts of the city".

Table 3.1 tackles spatial variations in the age of housing more directly using census data and assuming that all houses built after 1841 were still standing in 1871 (see Section 3.43). The figures given may understate the number of new houses in cases where houses built before 1841 were demolished and replaced by new buildings; available cartographic evidence suggests that, except in one area in St. Matthew's Ward, demolition during the period was very limited. If Table 3.1 is taken at face value, therefore, and is used in conjunction with Figure 3.22 (showing the area covered by each ward) several interesting features emerge. First, it is clear that construction between 1841 and 1851 was concentrated in the eastern half of the town (St. George's and St. Matthew's Wards in the south-east and St. Mary's in the north-east), while construction between 1861 and 1871 was largely in the north-west (St. Mark's). Secondly, the period 1851 to 1861 formed an era of transition: construction was concentrated

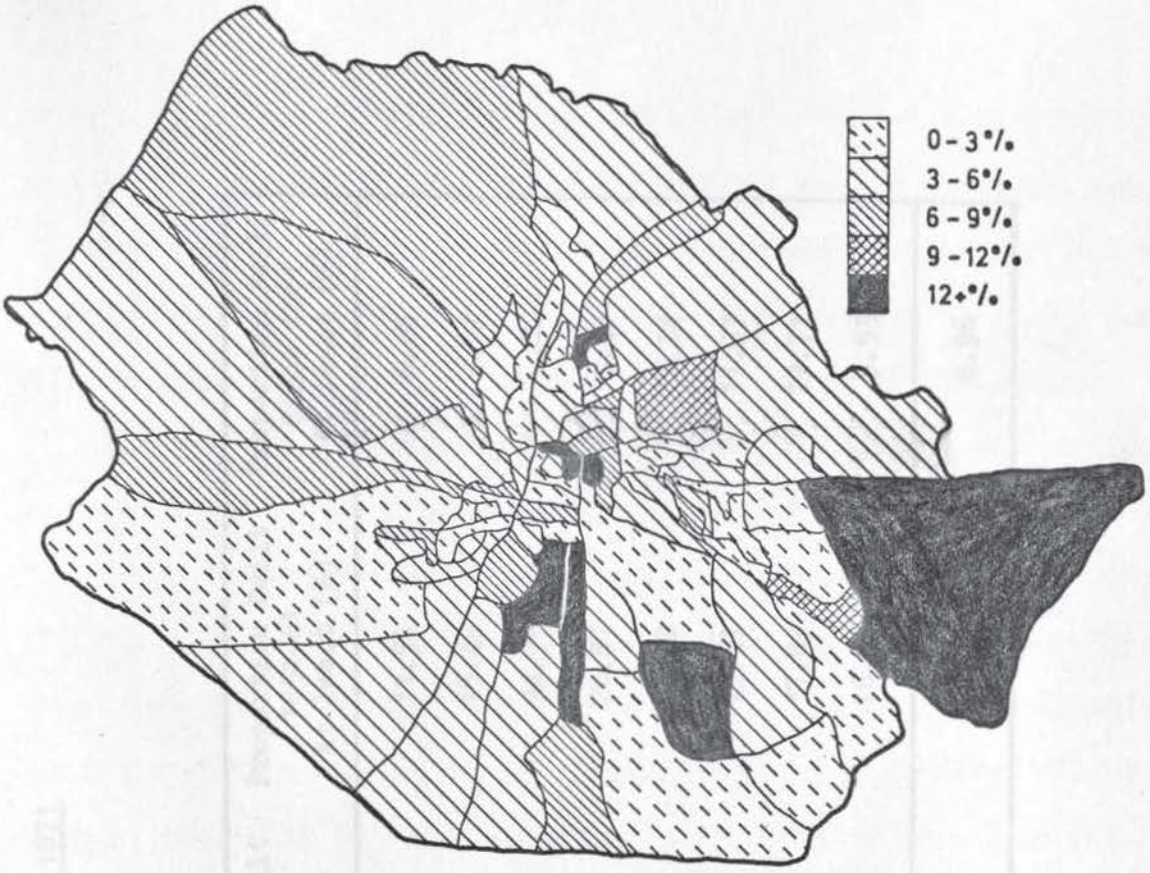


Figure 3·20: Percentage of Completed Houses Unoccupied: Wolverhampton 1851

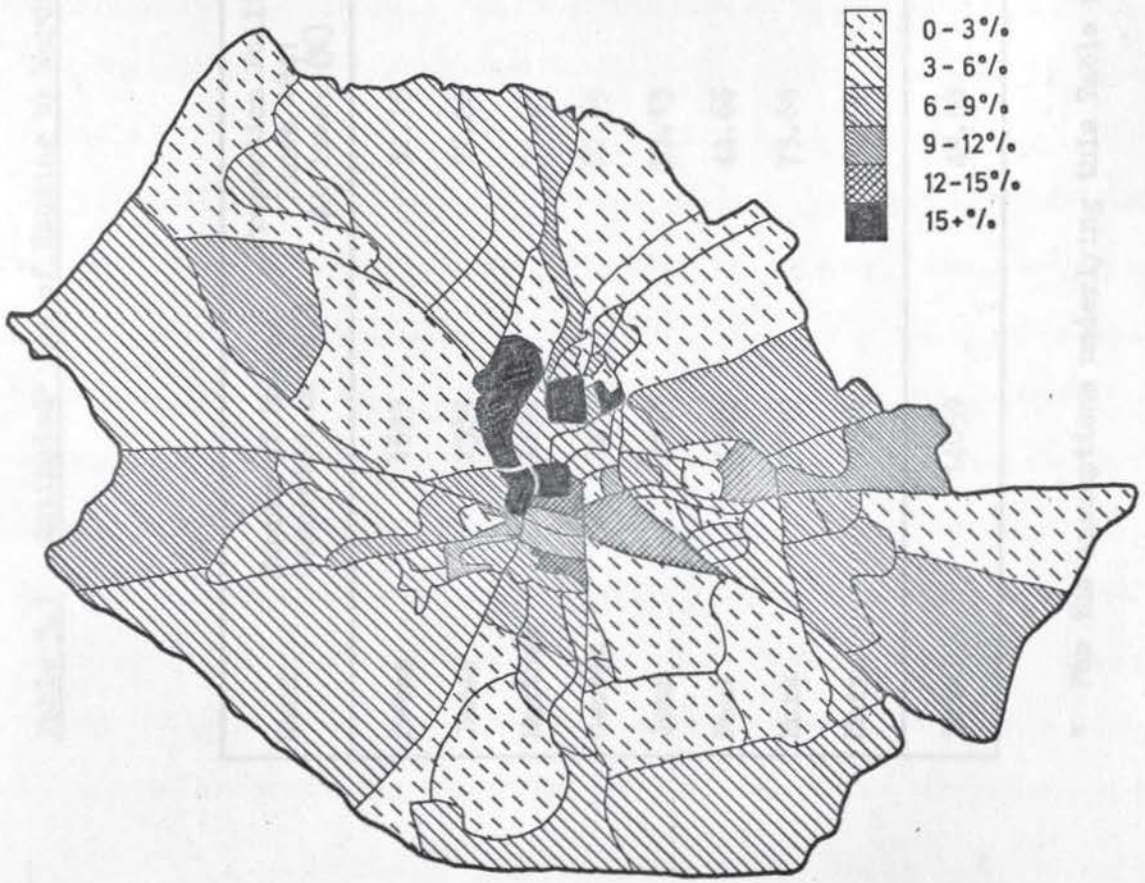


Figure 3·21: Percentage of Completed Houses Unoccupied: Wolverhampton 1871

Table 3.1 Estimated* Age of Housing by Wards: Wolverhampton 1871

Ward	Number of Houses Completed in 1871	Proportion Built Since 1841 At least (%)	Proportion Built 1841-51 At least (%)	Proportion Built 1851-61 At least (%)	Proportion Built Since 1861 At least (%)
Peter	1633	32.15	14.02	11.51	6.61
James	1589	27.88	8.24	15.42	4.22
Matthew	1836	51.25	26.31	24.95	----
George	1455	60.69	33.33	26.87	0.48
John	2165	55.15	15.43	27.48	12.24
Paul	1825	44.66	14.08	19.51	11.07
Mark	1710	73.68	6.08	37.89	29.71
Mary	1846	51.52	29.58	16.41	5.53
Total	14059	49.88	18.27	22.65	8.96

* For the assumptions underlying this Table see Section 3.43

in both south-east and north-west. Thirdly, by 1871 the area with - by far - the highest proportion of houses less than 30 years old was St. Mark's Ward in the north-west; St. James' Ward in the east had the lowest proportion of these 'new' houses. The superiority of St. Mark's Ward in regard to houses less than 10 years old was overwhelming.

This variation in density and age may now be coupled with differences in house types. The first step towards an analysis of house types was to develop a means of classifying the symbol's on Steen and Blacket's map of 1871. After careful scrutiny of more detailed maps, photographs and extant housing a four-fold typology (Figure 3.23) was applied to houses and shops alike - the two being indistinguishable on the available maps. Type A houses were typically humble cottages in terraces - occasionally back-to-back - each house represented by a small rectangle. Type B housing was similar, though often slightly larger, and with regularly placed outbuildings. Type C were 'tunnel backs', usually in terraces, but occasionally in pairs, while Type D houses were detached or imposing semi-detached properties. The distribution of each type was mapped, with each "house" present in 1871 being allocated to the type it most closely resembled.

Figure 3.24 shows the distribution of Type A houses in crude numbers per grid square. Three of the four areas of poverty, overcrowding and disease stand out immediately: Townwell Fold was too small to be adequately represented in this way. The limited extent of this, the poorest housing, in the west and north-west, and its extension in the east are obvious. Figure 3.25 treats Type B housing in a similar fashion, revealing a more general distribution. Mapping of Types C and D confirmed the concentration of better property in the west - particularly the north-west. Crude number per grid square is, however, a poor measure for this type of property, tending to overstate the importance of the town centre for better quality

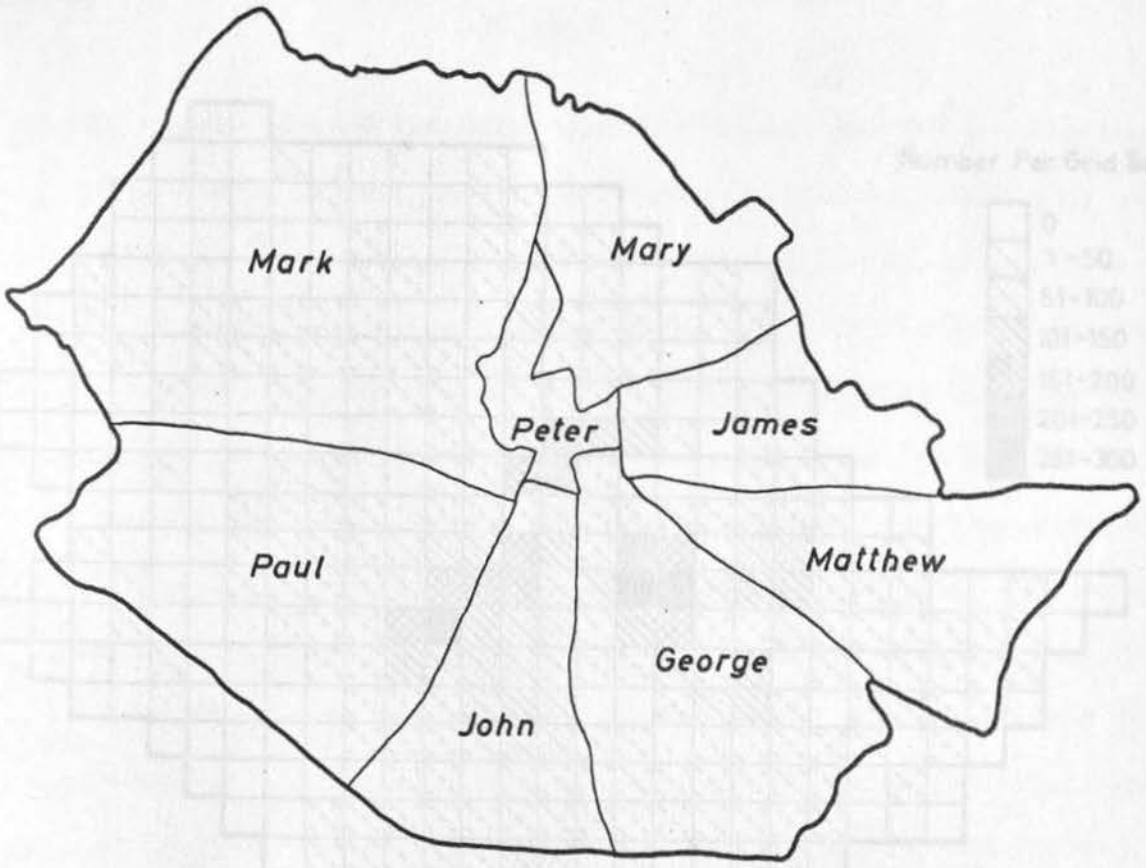


Figure 3·22: Wolverhampton Wards

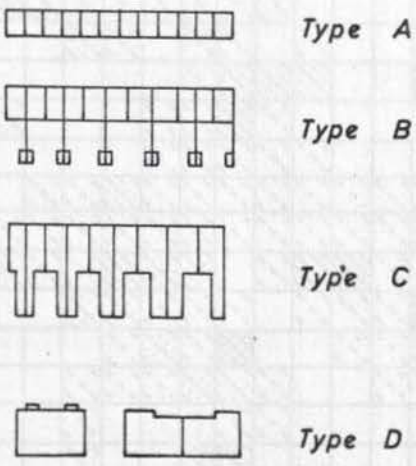


Figure 3·23: House Types

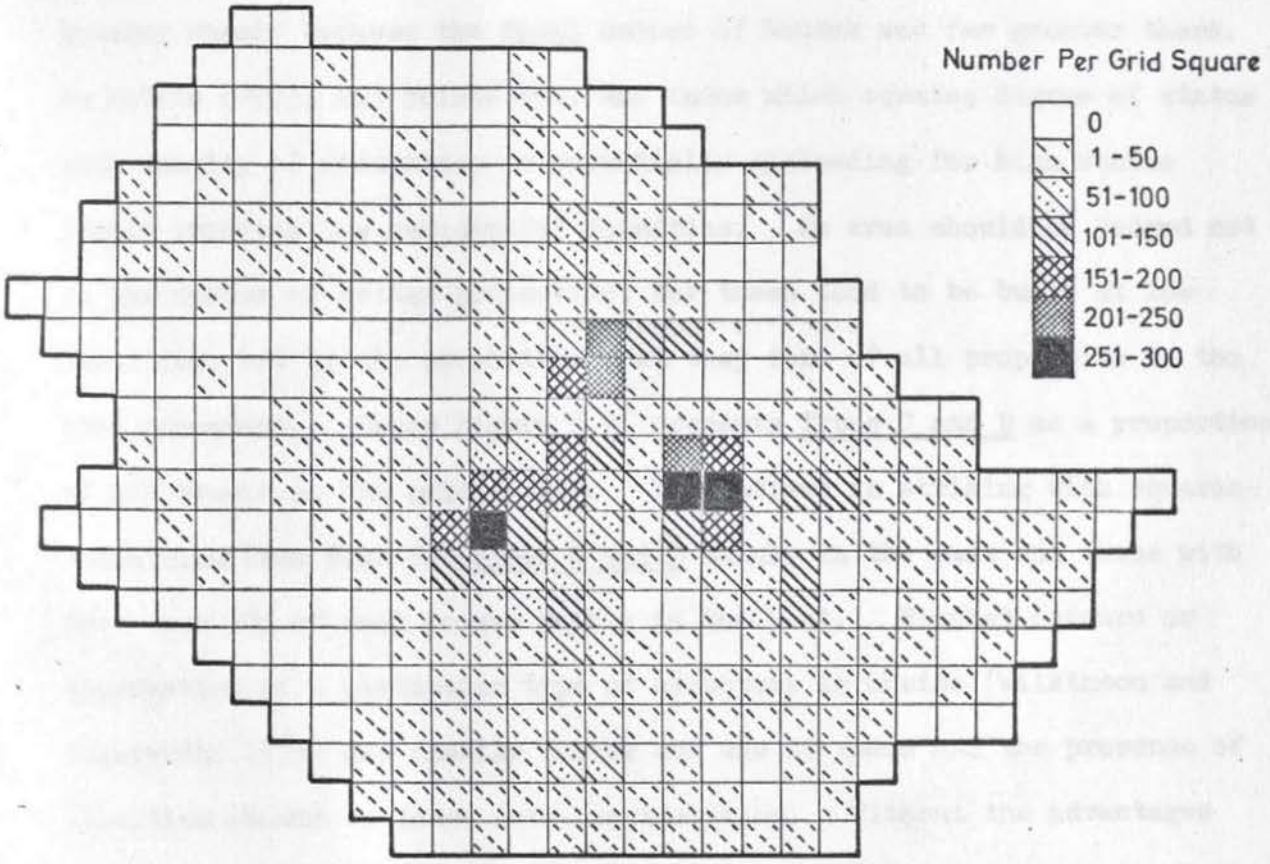


Figure 3·24: Distribution of Type A Housing: Wolverhampton 1871

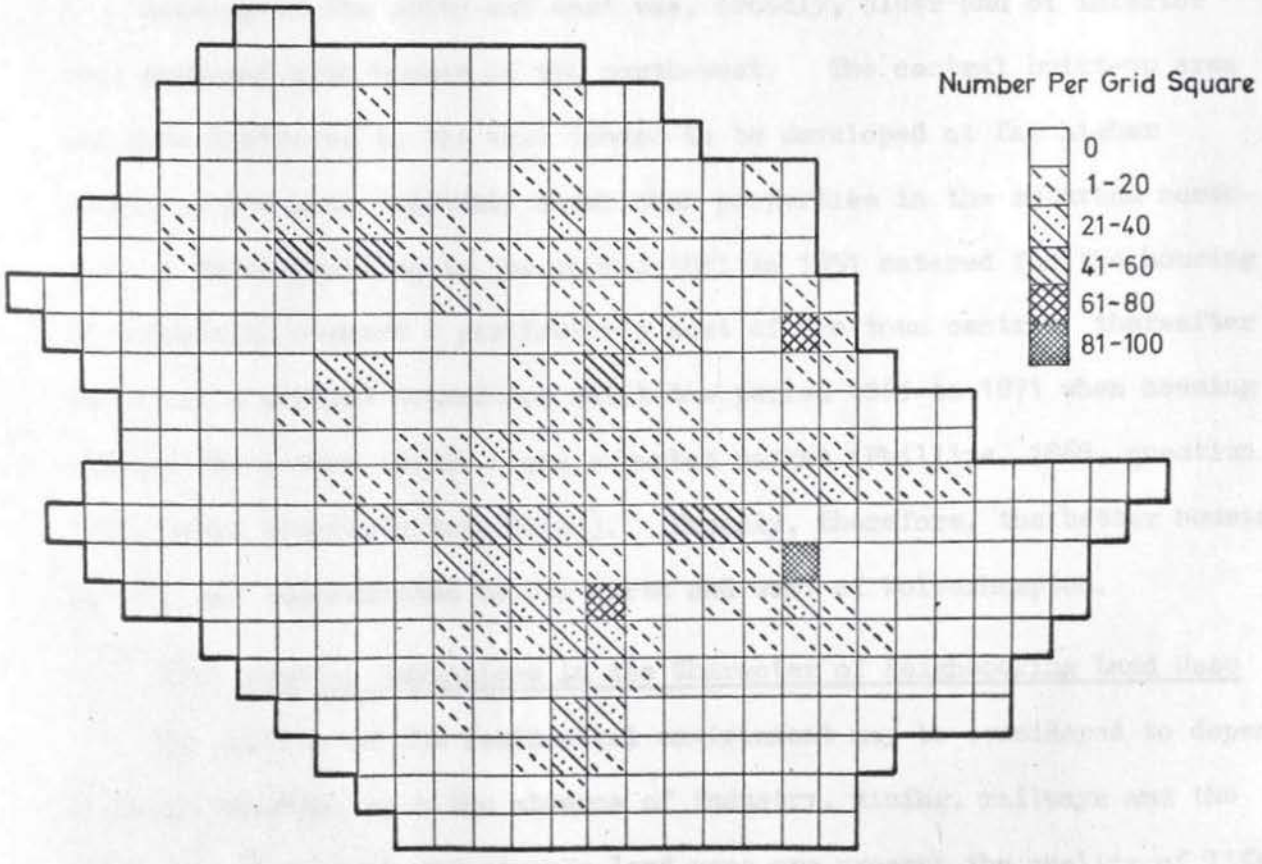


Figure 3·25: Distribution of Type B Housing: Wolverhampton 1871

housing purely because the total number of houses was far greater there. As Mathie (1973, 28) points out, any index which equates degree of status with density of occurrence is potentially misleading for high status itself involves low residential densities. An area should be judged not on the number of better properties, for these tend to be built at low densities, but by the proportion that they form of all properties in the area concerned. Hence Figure 3.26 presents Types C and D as a proportion of all houses in the grid square. The pattern is striking with squares containing less than 30% Types C and D mainly in the east and those with more than 70% of such houses mainly in the west. Blanket censure or approbation of a particular type of structure is unwise (Wilkinson and Sigsworth, 1970) and ideally number and use of rooms and the presence of amenities should be taken into consideration. Without the advantages of such data it is nevertheless possible to draw clear conclusions about the sort of housing available in different parts of Wolverhampton in 1871.

Housing in the south and east was, broadly, older and of inferior type compared with houses in the north-west. The central built-up area and some districts to the east tended to be developed at far higher densities and were certainly older than properties in the suburban north-west. House building in the period 1841 to 1851 catered for the housing of industrial workers - particularly east of the town centre; thereafter there was a gradual transition until the period 1861 to 1871 when housing catered for a more middle class suburban market (Phillips, 1868, question 1271, makes precisely this point). Broadly, therefore, the better housing in 1871 was concentrated to the north and west of Wolverhampton.

3.53 Spatial Variations in the Character of Neighbouring Land Uses

The quality of the residential environment may be considered to depend, in large measure, upon the absence of industry, mining, railways and the like, for where such undesirable land uses are present the quality of life

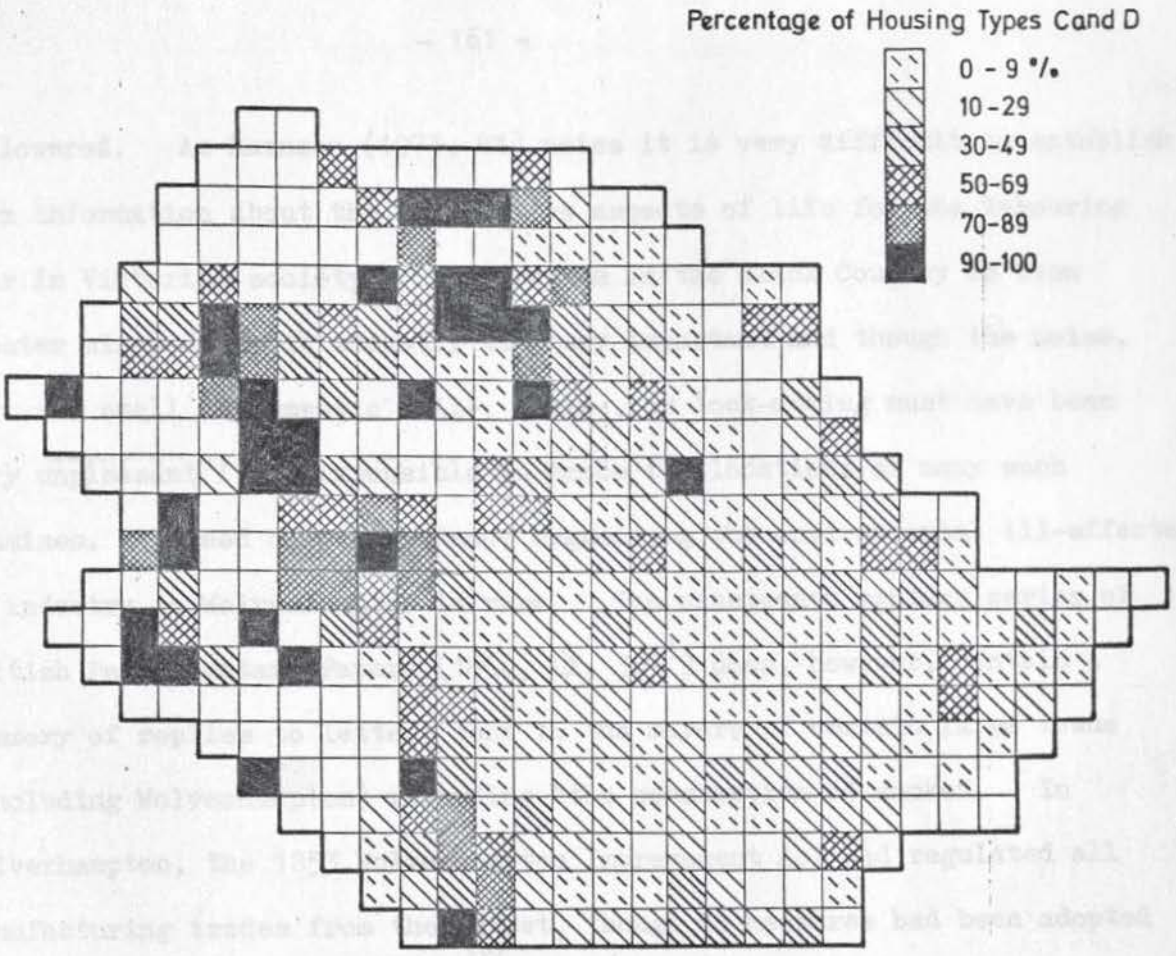


Figure 3·26: Proportion of Housing Types C and D: Wolverhampton 1871

is lowered. As Harnson (1973, 81) notes it is very difficult to establish firm information about the qualitative aspects of life for the labouring poor in Victorian society. The problem in the Black Country is even greater since domestic industry was very important and though the noise, dirt and smell of domestic nail-, chain-, or lock-making must have been very unpleasant it is impossible to trace the locations of many such premises. Indeed direct evidence suggesting the environmental ill-effects of industry in Wolverhampton is rare. The nineteenth century series of British Parliamentary Papers (1866, LX, 369[1]) does, however, contain a summary of replies to letters sent to the mayors of certain large towns (including Wolverhampton) regarding "the consumption of smoke". In Wolverhampton, the 1853 Wolverhampton Improvement Act had regulated all manufacturing trades from the outset, though no measures had been adopted to enforce this law and no proceedings had ever been taken. The existence of a problem is clear from the statement that "the subject has on several occasions occupied the attention of the Town Council". As to the effect produced in diminishing smoke nuisance, "It is difficult to say. The raising of chimneys and the alteration of fire-places, in certain instances, appears in the main to have given satisfaction" (ibid.).

Despite the difficulties, Figures 3.27 and 3.28 illustrate spatial variations in environmental quality as determined by the character of neighbouring land uses. The advantageous position of the west compared with central and eastern areas is unmistakeable, though treatment of industrial premises merely as presence of absence data grossly understates the environmental impact of large scale iron works in the east. The implication of the two maps is clear: residence in the north-west of Wolverhampton is likely to have been preferred to residence in the south-east.

---

[1] B.P.P. page numbers in this volume were found to repeat themselves.

Figure 3·27: "Undesirable" Neighbouring Land Uses: Wolverhampton 1871

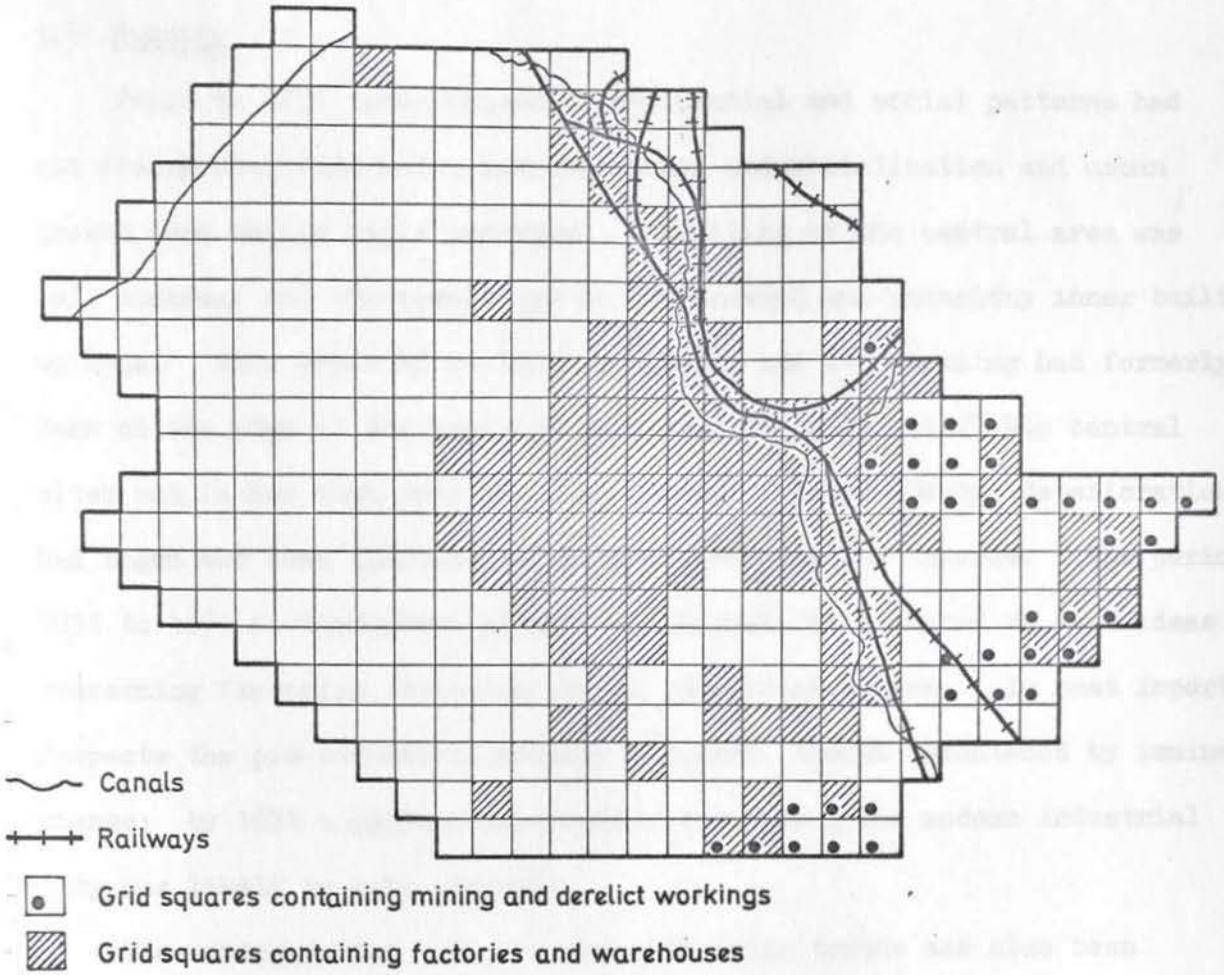
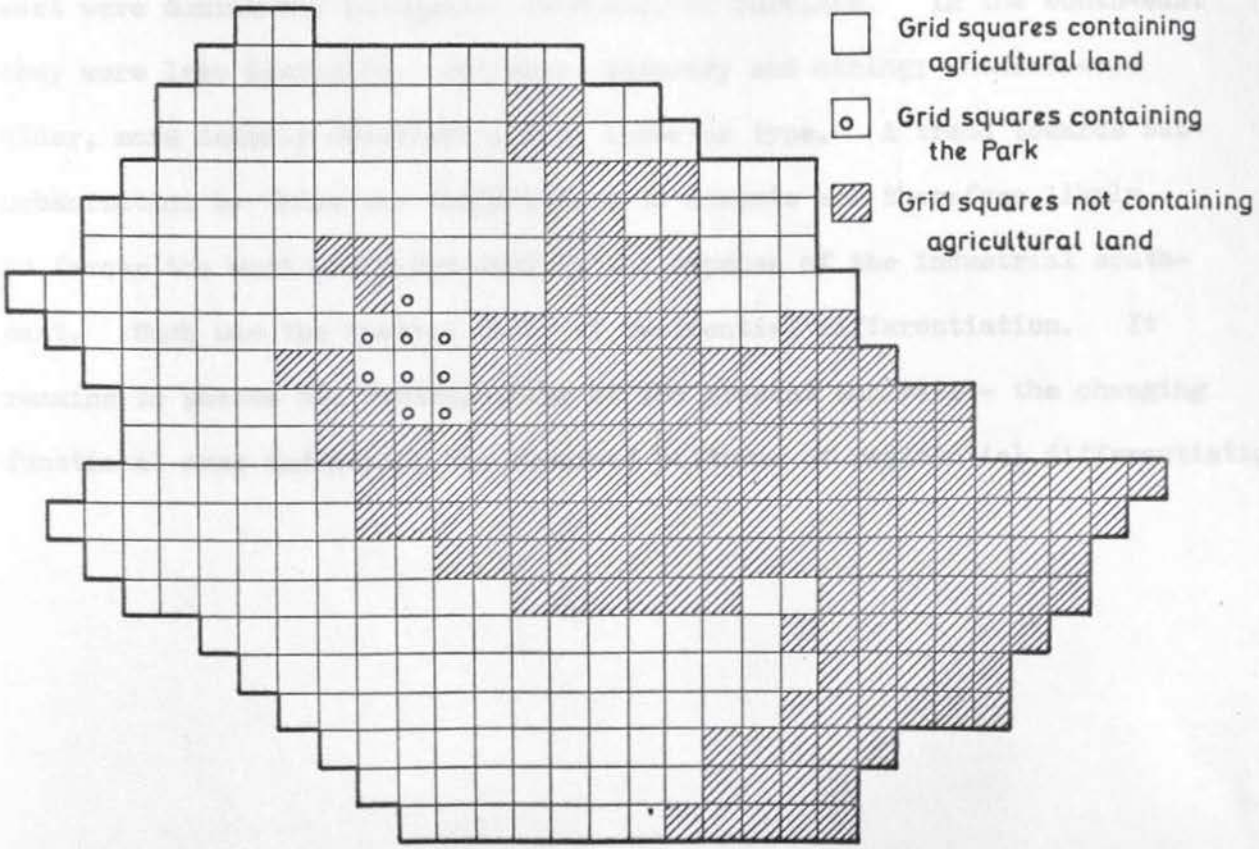


Figure 3·28: "Desirable" Neighbouring Land Uses: Wolverhampton 1871



3.6 Summary

Prior to 1851, pre-industrial residential and social patterns had not disappeared from Wolverhampton though industrialization and urban growth were making rapid progress. Infilling of the central area was well underway and the result was an overcrowded and unhealthy inner built-up zone. Four areas of particular poverty and overcrowding had formerly been on the edge of the town but construction on all available central sites had linked them into the town centre. Environmental deterioration had begun and some families had already left for the suburbs. The period 1851 to 1871 is therefore, it has been argued, well suited to test ideas concerning factorial evolution during industrialization. In most important respects the pre-industrial pattern lingered, though threatened by imminent change; by 1871 a pattern more nearly resembling the modern industrial city was likely to have emerged.

The environmental basis of these emerging trends has also been suggested, with the superior quality of the north-west (compared with the south-east) as the central theme. Neighbouring land uses in the north-west were dominantly pleasant: farmland, or parkland. In the south-east they were less desirable: railways, industry and mining; houses were older, more densely developed and of inferior type. A trend towards sub-urbanization by those who could afford to commute was therefore likely to favour the west and north-west at the expense of the industrial south-east. Such was the spatial basis of residential differentiation. It remains to pursue the central theme of the present analysis - the changing functional axes underlying the observed patterns of residential differentiation.

PART TWO

OPERATIONAL INTERPRETATION, VARIABLE SELECTION AND DATA HANDLING

Introduction To Part Two

.1 Operational Interpretation, Variable Selection and Data Handling

In Part One it was suggested that temporal evolution in the dimensions of residential differentiation characterized rapid industrialization and urban growth. This central hypothesis was elaborated to describe the detailed changes likely to have occurred in the residential patterning of an industrializing town. Finally, it was argued that, during the period 1851 to 1871, Wolverhampton was experiencing rapid industrialization and therefore constitutes a suitable test-bed for ideas of this type. As Camillieri (1962) notes, the formal truth of a theorem rest on a demonstration that it has been correctly inferred, while its empirical truth rests on its correspondence with observations; hence specification of operational definitions performs an essential co-ordinating function. Consequently, Part Two attempts to develop operational definitions, census-based indicants and analytical procedures suitable for objective testing of the hypotheses described earlier. Two types of problem emerged. First, nineteenth century conditions were found to demand re-definition of certain propositions - particularly those regarding household composition, the supposed decline of extended family patterns and the rise of the nuclear family. Secondly, it was necessary to examine the extent to which the limited range of census variables offered suitable indicants for each of the major conceptual dimensions.

This second problem receives considerable attention here, for Gittus (quoted in Lawton and Pooley, 1973, 30) claims that in the nineteenth century there is insufficient data for a multi-variate technique to be relevant. Taking this view seriously, census data must be carefully scrutinized to discover whether it is, in fact, possible to reflect enough of the diversity of the urban residential pattern to allow the testing of a three- or four-dimension hypothesis. If it proved impossible to

reflect one of the major axes adequately the value of the results would be very limited indeed. For this reason each of the following three chapters takes one of the major theoretical dimensions and attempts to ensure that it may be suitably reflected from the Enumerators' Returns. In so doing, discussion draws heavily on non-census sources to portray nineteenth century conditions and to assess the value of proposed indicants. This is intended both to avoid circularity of argument, and to answer criticisms which a factorial ecology of nineteenth century data may attract. Chapter 4 describes the selection of indicants of socio-economic status, Chapter 5 of family status and Chapter 6 of ethnicity. Finally, Chapter 7 discusses the extraction of the data from the Returns, and the analyses performed thereon.

.2 Information Available in Nineteenth Century Enumerators' Returns

Before questions of variable selection and of data manipulation are tackled it is necessary to describe the information present in the Enumerators' Returns. The first four decennial censuses of England and Wales (1801-1831) adopted simple tally sheets and no useful information survives apart from published material. From 1841 each household was given a separate schedule for completion; this was collected for transcription, by the enumerator, into a book. These books survive and, after 100 years, are available for public inspection: hence data for 1841, 1851, 1861 and 1871 were available for the Wolverhampton analysis. Initially, all four censuses were used, but this limited the range of comparable variables - the 1841 returns being different from those of 1851 to 1871. There were, moreover, two Enumeration Districts missing from the returns of 1841 (Wolverhampton East 12 and 13). It was difficult to decide exactly what areas these would have covered for their descriptions are missing too, and part of the section of Wolverhampton falling outside the 47 EDs whose limits were known was in fact enumerated in ED 11. In 1841

the total population was small, so that there were far fewer EDs, though the problems this posed for grid square analysis (see Section 7.2) could have been overcome by a larger sampling fraction. Finally, the 1841 returns appeared to violate ward boundaries quite seriously so that - unlike the returns of 1851 to 1871 - they did not permit derivation of ward data by simple aggregation of Enumeration Districts.

The information recorded for each individual may be briefly summarized as follows. In 1841 the returns gave address, name, age and sex, occupation and birthplace. In many cases, however, the address was merely a street name without any number. Age, for those of 15 and over, was recorded to the lowest term of five years and birthplace was classified as in the same county as enumeration, elsewhere in England and Wales, and in Scotland, Ireland and Foreign Parts. In 1851 and thereafter age was recorded in completed years, birthplace was recorded by parish and county, and both the marital status and relationship to the head were given for each household member. The incomplete description of address persisted, being more a reflection of the absence of recognized numbering in large parts of nineteenth century Wolverhampton than an indication of the inadequacy of census practice. Trade Directories (Bridgen, 1838 and 1847; Pigot and Co., 1842; Kelly, 1845 and 1860; Jones and Co., 1862-3 and many others) show the very slow improvement in this respect which is mirrored in the returns of 1871, where more full addresses are recorded than ever before.

The reliability of returns is a matter of debate. Dunlop (1916) examines the errors of statements of ages for young children while Drake (1972, 20-3) notes the inability to recall one's precise age common in the nineteenth century and the tendency of some women in their late teens to overstate their age to bring it over 21. There is also evidence of accidental omission of certain areas (ibid.) and of deliberate understatement of numbers in overcrowded households (ibid.). It is generally

accepted, however, that the returns are of a high standard and that inaccuracies are unlikely to have a significant effect for most purposes (Armstrong, 1967, 1968 and 1972; Anderson, 1972, 134-45). Though a sceptical attitude allowed glaring inconsistencies to be corrected, nothing could be done about most errors and it was necessary to rely on the returns as they stood.

The most serious problem with the Enumerators' Returns did not concern information about individuals, but aggregates such as families, households and groups of lodger. This posed a definite barrier to comparative analysis through time for the definitions and practices of enumerators were found to change. The way in which some standardization was achieved is discussed in Section 5.2, but the source of confusion must be explained before this is possible.

The origin of the problem lies in the loose definition of 'household'. Before 1851 enumerators were given no precise instruction regarding interpretation of the word 'house'. The definition used in 1851, 1861 and 1871 was vague: "all the space within the external and party walls of a building". Under the last person entered in each house a long line should be drawn by the enumerator (or in 1861 and 1871 a double stroke '//'), and where there was more than one family in the house a short line (or single stroke '/') should follow the last name of the family of each occupier. In addition, each occupier was given a separate schedule and these are numbered on the enumerators returns. (See Armstrong, 1968 and Tillot, 1972.)

Unfortunately, new schedule numbers do not correspond, in many cases, with the occurrence of short line or single stroke delimiters and it is clear that many enumerators gave each lodger in a house a separate schedule, while others gave only one schedule for all lodgers, even if there were two distinct families amongst that group. Precise practices vary from census to census, and in 1851 omission of long and short lines at the

bottom of pages is commonplace. Occasionally a new house is counted and a new schedule number begun, the first person entered is described as 'head' and his surname differs from that of the previous entries yet there is no ruling to confirm the new house. Some enumerators were prone to what is assumedly accidental omission and the error may be recognized clearly - often a new entry in the address column confirms the oversight. But more confusing cases may be found, as where a new house is indicated - but the ruling is absent - and the first individual is described as 'lodger'. In such cases, the ruling was often not totally absent, but a short line was present where a long line might be expected. The only solution in this situation is the adoption of standard rules as described by Anderson (1972, 134-45) and discussed in Section 5.2.

One point must be stressed before variable selection is attempted. The cases of doubt were very few compared with the total population; in most of the returns everything was correctly arranged (Armstrong, 1968 confirms this for York). The problem is given some attention, however, because of the effect which misinterpretation might have upon a systematic sample of households. If, for example, enumeration errors were (wrongly) assumed whenever a separate family existed <u>within</u> a household, and if a new household was (wrongly) counted in such circumstances, then areas of multiple occupancy would appear little different from those in which most households contained one and only one nuclear family. The implications for sampling are discussed in Section 7.1.

.3 <u>Variable Selection</u>

The following three Chapters describe the 26 variables used in the subsequent analysis. Though considerable space is devoted to assessing the value of these variables in reflecting the major theoretical axes, it must be conceded that variable selection involves arbitrary choices. Some arbitrariness is perhaps unavoidable, for the same data can be presented

in different ways: the sex structure, for example, might be represented as males/females, females/males, males/total population or females/total population. But arbitrariness is more fundamental. There may be no objective reason for preferring one indicant of a particular axis to many of the others which the Enumerators' Returns would support. Furthermore, to reduce the workload to manageable proportions, variables had to be chosen prior to analysis and before any of their disadvantages became apparent. The present work does not claim total objectivity of variable selection, nor even that the 26 variables adopted are the best that could have been chosen. Possible modifications to the variable list, which might have been made with the benefit of hindsight, are discussed in Section 11.1. It is, however, argued that the variables chosen adequately reflect the underlying theoretical dimensions; the following Chapters are devoted to the amplification of this point.

CHAPTER 4 INDICANTS OF SOCIO-ECONOMIC STATUS AND OF OCCUPATION

4.1 The Nineteenth Century Background

4.11 Industrialization and Increased Social Stratification

The great increase in business activity accompanying the Industrial Revolution allowed greater product specialization and finer division of labour, producing

> "a gradation of skills, both in the general sense as applying to all workers with hand or brain, and in the particular sense inside each trade or industry. This stratification of labour was reflected in the value of the weekly pay packet, and as money became more and more the universal nexus ..... the social position of a man became more and more closely related to the nature of his work. The stratification of labour produced with it a stratification of society, and consideration of a man's job provided a pretty accurate clue to his chance of a reasonably comfortable ..... life" (Evans, 1968, 158).

The social stratification system was no longer rigidly closed; individuals could move upwards by spatial and/or occupational mobility, by acquiring real and personal property, and by adopting new cultural habits (Harrison, 1973, 174-8). Some argue that the continued existence of class lines when dividing barriers were breaking down provided the incentive to economic competition (Houghton, 1957, 186): instead of a society containing irremovable inequalities, a system of social stratification emerged which permitted individual advancement.

Houghton (ibid., 5-7) sees the emerging society as both more democratic and more industrial than the one it was replacing. Symbolic of the democratic society are the Reform Bills slowly transferring power from the aristocracy to (some of) the people, and the words of Mill (1869; reprint 1912, 445) proclaiming "human beings are no longer born to their place in life ..... but are free to employ their faculties ..... to achieve the lot which may appear to them most desirable". The breakdown of the old conception of status owed something to ideas about human rights but its main cause was economic: the growth of commerce, drawing men from the

land and offering careers to talent was instrumental in dissolving the feudal nexus of society. The industrial society Houghton characterizes by more canals, macadam roads, railways, steam boats, greater use of machines in production, and their concentration in factories.

> "The old system of fixed regulations which paralleled that in fixed social relations, was abandoned for the new principles of laissez faire, on which the manufacturer bought his materials in the cheapest market and sold them in the highest, and hired his labour wherever he liked, for as long as he pleased, at the lowest wages he could pay. ..... When class lines broke down and it became possible as never before to rise in the world by one's own strenuous efforts, the struggle for success was complemented by the struggle for rank. Even apart from personal ambitions, the very existence of hundreds of objects once unknown or within the reach of few, now made more widely available and therefore desirable, increased the size of one's expenses and the load of his work. Moreover the growing wealth of the wealthy advanced the style of living in the middle and upper classes to a point where the Victorian had to struggle for things his father had been able to ignore" (Houghton, 1957, 5-7).

The increased competitiveness of society also resulted from the emergence of a dominant set of social values. The traditional work patterns of a rural population were unsuited to the needs of the factory. The working classes had to be convinced that if they would adapt to the status quo as quickly as possible they would benefit to the full in the good times that were coming (Harrison, 1973, 163-4). The middle classes therefore became conscious of their own position (Banks, 1954) and tried to inculcate the labouring poor with their own puritan values of hard work, self reliance and thrift (Harrison, 1973, 36 and 168-9). Gradually, therefore, habits of deference and a hierarchical ideology with which acceptance of the social order seemed "natural" were replaced by a more competitive, more fluid situation with wealth and respectability as twin goals. The role of the middle classes in impressing their own values upon the labouring masses led, it is argued (Banks, 1954), to middle-class self awareness; this class awareness very gradually spread to the working classes (Harrison, 1973, 42).

Best (1973, 279) argues that the decline of an automatic acceptance of the social system dates from around 1875, but even he concedes that "there is some evidence that feelings of deference were weakening from the late sixties onwards". Most other commentators put the date of major change much earlier. Houghton (1957, 186), for example, quotes Mill - writing in 1840 - as suggesting "that entire unfixedness in the social position of individuals - that treading upon the heels of one another - that habitual dissatisfaction of each with the position he occupies, and eager desire to push himself into the next above it" had become or was fast becoming a characteristic of the nation. Similarly, Harrison (1973, 42) states that, "The new terminology of class did not immediately supersede the language of an older pre-industrial society, but continued side by side ..... In the 1830s and 1840s the problems associated with an accelerated rate of economic and social change encouraged the new way of thinking, but the switch ..... was not yet complete" for Britain's economy was only partially industrialized with factory organization more advanced in some sectors than in others (ibid., 184).

Several conclusions emerge from the foregoing discussion. First, the pre-industrial social ladder with few, widely separated steps was replaced by a far larger number of finely graded social strata. Secondly, this change occurred only gradually and at different rates in different industries and regions. Thirdly, significant movement may be expected to have occurred during the period covered by the present analysis.

4.12 Criteria of Social Status in Victorian England

In analyzing nineteenth century social stratification systems, the modern researcher cannot rely unquestioningly upon his own twentieth century measures of status but must seek to establish the criteria relevant to the period under consideration. Selection of census indicants of socio-economic status depended heavily upon what is known of Victorian criteria of social position and these must now be examined in detail.

Possession of a landed estate was the surest way to gain recognition as a gentleman (Harrison, 1973, 115) and the Victorian "had not only to be rich but to be a gentleman" (Houghton, 1957, 185). But landed society did not retain its position of superiority without adaptation: assimilation of successful industrialists was mutually beneficial. For the old elite it brought access to some of the new industrial wealth, while the middle classes gained exclusive social prestige. Though marriage was the usual form of alliance, purchase of a landed estate was possible too and scrupulous adherence to county conventions would ensure that the new land owner, his children and grandchildren would gradually be accepted and overcome the stigma of non-gentle birth.

The middle classes - more important in Victorian England than ever before - held the position below the landed gentry. As tests of membership, Harrison (1973, 128) lists an "income above a certain minimum ..... a particular occupation or calling ..... education, religious affiliation and style of home ....." Within these limits he distinguishes between the upper middle class including "industrial magnates (who) dominated the regional scene ....." (ibid.), and the more prosaic lower middle classes encompassing small manufacturers, shopkeepers, coal and corn merchants, master tailors, inn-keepers and dealers; "..... in a word, 'tradesmen'. To them should be added a growing army of clerks, office workers, schoolteachers, and the lower ranks of the professions..... By aristocratic criteria the lower middle classes were distinguished by the taint of trade or the performance of some paid service; by their own criteria they were respectable people who did not have to live by manual labour" (ibid., 130), and whose respectability was manifest in their patterns of expenditure and of family living. A nice house, maintenance of servants and - where possible - possession of a horse and carriage were all middle class goals. A particular family pattern was also crucial, for the income of a 'respectable' family was earned by the household head alone.

Below the middle classes were the labouring masses characterized by their sheer numerical size (ibid., 43-4) and their separateness from other classes. "Between manual and non-manual occupations a great gulf was fixed" (ibid., 44-5). But the category as a whole was very diverse with social position depending upon the level of earnings, the regularity of employment, the type of skill, the trade or industry concerned and the amount of training and education required (ibid., 45-51). Closest to the middle classes were an emerging group of foremen, managers and others in responsible manual positions. Just below them came the skilled workers who had a recognized place in the community, and a dependable, relatively good income. But below the skilled labourers were a very large number of unskilled men without political power or value, ignorant, illiterate and exposed to the full consequences of sickness and cyclical unemployment. If a typical workman fell ill he almost inevitably had to rely upon the Parish; he was underpaid, underfed and ill-housed. At the very bottom of the social ladder were the complete failures - the lazy and the unfortunate together who had lost, or failed to gain, a place in society: these paupers, thieves, prostitutes and the like formed the 'submerged tenth' of Victorian society.

In nineteenth century Wolverhampton the presence of a significant number of "landed gentry" may be discounted, and in such circumstances "..... the solicitor, the brewer, the doctor stepped into the breach ....." (Burn, 1964, 264). Since it is likely that members of the middle class formed the upper echelons of society in nineteenth century Wolverhampton it is to the criteria defining their position that most attention is given. Two views are tenable: either the term "middle class" refers to a definite and distinct group with clear class boundaries, or else "middle class" refers only to a relative position (or group of similar positions) within a status continuum (Landecker, 1960). The former approach, suggesting a

definable class structure, may seem particularly apt in a period of middle class self consciousness - particularly when contemporary writers refer repeatedly to the same criteria of middle class membership. Even so, the continuum view seemed more helpful: although most admit that income, for example, was an important criterion there is little agreement about the minimum income which may be regarded as "middle class". If, as has been suggested, social stratification was becoming more intense, a continuum is a more fitting description of social status. There is also a greater freedom in the selection of break-points on the social ladder.

It has already been suggested that occupation formed an increasingly important measure and determinant of social status. Clearly, what is required, therefore, is some means of classifying occupations directly according to the status which they implied. Section 4.31 examines the ways in which this may be achieved and so forms the basis for the selection of two key indicants of socio-economic status. Unfortunately, however, the approach is rooted in twentieth century criteria, making it desirable to derive additional measures which - by reflecting the Victorian world more faithfully - may serve as a check on pure occupation-based variables.

Income is generally admitted to have been important, with many sources suggesting £300 p.a. as the minimum, though most of the lower middle classes earned only £150, with clerks earning under £100. Census data include no information on incomes, so occupational types would have to be classified according to likely earnings. This technique is not unknown (Anderson, 1971, 26; Mawson, 1972) but relies upon the existence of a table of wage rates. This information was not available specifically for Wolverhampton, and the need for data covering 1851, 1861 and 1871 in sufficient detail to allocate every occupation listed, made it improbable that this method would ever be widely adopted for temporal comparative ecologies of nineteenth century census returns. Moreover, this approach ignores regularity

of employment and dependability of income: a major distinction between middle- and working-class occupations was the greater susceptibility of the latter to cyclic unemployment. The seriousness of this problem is increased by the enumerators' failure to record unemployed workers consistently and comprehensively: in 1861 Wolverhampton was suffering depression, yet the number so returned is similar to that in 1871 when trade was far better. Finally, it is clear that income is a very imperfect measure of status. Jefferies (1880) writes of a bank clerk "..... his salary was not high, but then his 'position'". A skilled artisan might easily earn more, but would not normally be regarded as middle class.

Many authorities define the middle class at least partly in terms of respectability (Harrison, 1973, 130; Best, 1973, 279-86; Houghton, 1957, 184-5) and though the concept lacks precise meaning, particular connotations deserve attention - especially as the Victorian saw wealth and respectability as two aspects of the same thing. Three facets of respectability will be considered in turn: occupation, expenditure patterns, and distinctive family styles.

Some occupations were undoubtedly "more respectable" than others: white collar employment than manual work, professions than retail trade. But attempts to allocate census occupations between manual and white collar categories posed numerous difficulties and anomalies. Thus a master lockmaker controlling a considerable business and employing ten men was classed as a manual worker because the enumerator used the word "lockmaker" to describe his occupation; yet his clerk was classed as a white collar worker. Correct classification in such circumstances was (usually) achieved by adoption of the direct allocation of occupations to socio-economic groups, as described in Section 4.31; this method also recognized the middling status of better paid skilled artisans and lower paid clerks.

Certain patterns of expenditure were also indicative of middle class status, for 'respectability' required conformity with expected consumption norms. "A house of suitable size and location was the first requisite. Depending on the amount available for rent (about one eighth of total income was considered normal) this could vary from a six-roomed terrace house for the lowest paid clerks and book-keepers, to a substantial villa with ten or more rooms" (Harrison, 1973, 132). To rely on housing criteria for a definition of middle class status would be to introduce an element of circularity into an analysis of residential differentiation which considers the congruence between the social and physical structures of the city. The census offered no data regarding house types, and it was therefore impossible to use housing criteria as a measure of status even if this had been desirable. But other aspects of consumption are worthy of closer scrutiny.

Two of these recurr repeatedly in comtemporary accounts: the keeping of a horse and carriage, and the maintenance of servants. The former indicated very high status but was difficult to assess from census returns. The absence of a flyman (or equivalent) could not be taken to prove the absence of a horse and carriage. Moreover, many households containing flymen, ostlers etc. had clear commercial reasons for maintaining their own vehicles. A similar problem attended the keeping of domestic servants. Nevertheless there is wide agreement that respectability in mid-nineteenth century England demanded the maintenance of resident domestic assistance. As late as 1901, Rowntree still took the keeping of servants as the distinction between middle- and working-class (see also Black, 1891, 218).

> "The keeping of servants was for the middle classes more than just a matter of living comfortably or defining one's status within the ranks of superior persons. It went to the very heart of the idea of class itself, ... (for) class is not a thing or a category but a human relationship (Thompson, 1963, 9-11) ..... The essence of middleclassness was the experience of relating to other classes ..... With one group, domestic servants, the middle classes stood in a very special and intimate relationship: the one in fact played an essential part in defining the identity of the other." (Harrison, 1973, 137).

But use of domestic servants as a measure of status was not without disadvantages. First, domestic servants form one element of household complexity - however wedded to social status it might be - and should ideally be treated separately. Secondly, some "domestic servants" were, in fact, employees in a domestically organized business and were maintained for commercial reasons; hence certain occupations (such as inn keeper or publican) might be erroneously attributed a high social status. Nevertheless, possession of domestic servants seemed to form the basis of a measure of status so long as it had no role in determining the social class to which individuals were allocated. Without any such definitional link between the maintenance of servants and high status it was possible to judge the value of "servants" as an indicant of status on its own merits.

Finally, certain patterns of family life were regarded as respectable. In particular, and unlike the labouring family to which several members might contribute earnings, the middle class family depended on the income of its head alone. Middle class wives and children did not go out to work, and older children remained financially dependent on their father until they had made their way in business or, if girls, had married (Harrison, 1973, 142). Hence employment of wives and of children offered potential measures of status. Unfortunately working wives might indicate non-familist values associated with the family status axis (Chapter 5) and therefore could not be used to measure status. The value of child employment as a measure of social status was felt to warrant further investigation.

Evidence from nineteenth century Parliamentary Papers made it clear that Wolverhampton parents would only have sent their children to work from economic necessity. There were numerous references to child fatalities in the town's mines, and the fifth report of the Children's Employment Commissioners (1862, 152-3) also included evidence of employment practices

in Wolverhampton brickyards. The yard of Mr. J. James, Steel House Lane, for example was managed by John Kensell who employed 5 men and 10 girls. "There are no boys employed ..... they are too forward; they do better in the pits and ironworks ..... The girls mould bricks, carry clay, and carry off the bricks." Jane Tranter, 17, carried bricks away. "I come at 6. I go away at 6 at night ..... I sometimes work ..... to half-past 8." Ann Clemson, a brick-moulder had worked in a brickyard for five years. "I carried clay at first. We get it from the pit. It is the hardest work we do. ..... I got 5s a week then. I was about 12 years old. Annie Webb is the youngest girl here. She is working with her father and mother. I get 10s a week now. ..... Girls work at carrying clay in winter ..... It is very cold work ..... We don't work so long then and we get less wages." William Webb stated, "I get the clay and temper it. My wife moulds. I have two of my own children and another girl to carry the clay and the bricks. My youngest girl was 8 this last April. The other girl is 13" (ibid.). The evidence of George Woollam, manager of Mr. Baggott's yard, also in Steel House Lane, is worth quoting in full.

> "We have two moulds at work now. There is one moulder and two other girls to each table. There is no girl under 14 working in the yard. It would never be worth one's while hiring girls under that age. We never give lower wages than 6s 6d. The little girls work to help the other girls. They are not hired by the employer. I have had my own girls at the work, but not now. If they don't do this, and their parents want their earnings, they must go to cinder washing or the coal-bank. There is no work on Sundays in the brickyards, except keeping up the fires in the kilns. The girls at the furnaces have to work on Sunday mornings, filling mine" (ibid.).

Clearly the type of work performed by children was hazardous and unpleasant, and child employment implied economic need. But whilst child employment offered a useful ancilliary measure of socio-economic status, some caution seemed advisable. Since the cost of feeding and clothing the child was one source of economic difficulty there may have been a link between large families and child employment. Further, it is possible that certain ethnic or occupational groups may traditionally have employed child labour -

either as part of a distinctive value system or as a means of training within domestically organized trades. For these reasons child employment was adopted as one of a number of measures of status and was so used that high values were not - by definition - linked with low status.

Occupation (when appropriately grouped into social classes), maintenance of domestic servants, and the extent of child employment all appeared to mirror Victorian criteria of social standing and therefore offered themselves as measures of socio-economic status. It remains to describe the way in which census indicants were selected.

4.2 Census Data, Classification, And Problems of Measuring Socio-Economic Status

4.21 The Classification of Occupation by Status

The first need was to develop measures of socio-economic status from census occupation data by classification into social classes. Ideally, a nineteenth century view of the status of different occupations was required. Indeed, had it been possible, a separate classification for each of the three censuses might have been comtemplated if necessary. The status of occupations such as handloom weaver changed rapidly in the nineteenth century (Bythell, 1969) and a similar fate, though in lesser degree, overtook Black Country hand nail makers (Davies and Hyde, 1970). A different list of occupations might therefore have been required to define the bottom twenty per cent in 1851 from that suitable for 1871. Problems of comparability would be slight compared with the confidence inspired by a classification rooted in the period concerned. When an attempt was made to devise such a system, difficulties soon became apparent.

Each occupation enumerated was listed together with the number of servants in the household concerned so that occupations might be ranked according to the number of servants they permitted. Attention was focused

inadequate for the needs of the present analysis owing to the absence of any comprehensive list of occupations to facilitate classification on a consistent basis. Armstrong makes this point, and also considers many alternatives to the Registrar General's approaches are "too refined for the data" (ibid., 202). Reluctantly, only those classifications developed by the Registrar General could be considered seriously.

Classifications used in the censuses 1801 to 1831 inclusive were based upon broad occupational categories which related more to the industry concerned than to the status of the individual worker, thus in 1831 one category include those "employed in retail trade or handicraft as masters or workmen". In 1841 an alphabetical listing of occupations was all that was offered. The new categories adopted in 1851, and retained in broad outline until 1911 (when a new system was devised), continued to reflect industry as much as status, with categories such as 'persons engaged in numerous branches of manufacture' and 'persons engaged in defence of the country'. There were many revisions (Armstrong, 1972, 194) but the schemes adopted in 1901 and in 1911 retained the main features and disadvantages of the system introduced in 1851. Armstrong (ibid., 195) notes that "..... whereas the nineteenth-century groupings of occupations were made to correspond roughly with industrial groups, but not without social-class overtones (in that the average level of prestige of some occupational orders was clearly higher than that of others), ... the distinctions have (now) been made highly specific, so that ... modern census ... tabulations (are) drawn up on all three bases (simple occupation, industrial-grouping, social class)".

It became apparent that a twentieth century classification would necessarily have to be adopted if the theoretical dimension of socio-economic status were to be successfully operationalized. Conceptually there is a clear distinction between the industry within which a particular occupation

is persued and the social status of that occupation. Thus a managing director and an unskilled labourer might both work in the building industry though their status was very different. This distinction is not made in nineteenth century classifications, so that adoption of any scheme earlier than the Registrar General's 1911 approach would prevent the testing of hypotheses suggesting a transition from segregation by industrial grouping to segregation by socio-economic status. On these grounds alone the application of a twentieth century classification to nineteenth century data seems justified. Ideally a pure-status classification should be developed for the nineteenth century - though several different ones might be needed to take account of spatial and temporal variations. But in the absence of such a scheme, and without the data which might allow its construction, adoption of a twentieth century classification seems the only viable alternative. This is an area of considerable debate (Anderson, 1971, 200, voices his disapproval of Armstrong's approach) but a better method has yet to be proposed (ibid., 25 clearly does not provide the answer, relying on income regularity of employment and employer/employee status to define "socio-economic groups" with a considerable industrial-grouping component).

Armstrong's reasoning in preferring the Registrar General's classification of 1951 to the broadly similar schemes of 1911 and 1921 is complex and need not be repeated here (see Armstrong, 1972, 205-15). The 1911 classification is dismissed as a first, hasty and unrefined attempt with the undesirable feature of grouping all white-collar workers (including commercial travellers, clerks, school teachers, and "builders") in Social Class I (ibid., 205). The 1951 classification is preferred to that of 1921 partly because only one printed volume is required to make all attributions compared with two in 1921 (ibid., 209). Detailed treatment of such groups as clerks, commercial travellers and char-women may provide

minor grounds for favouring the 1951 system too (ibid., 208). It was decided to follow Armstrong in relying largely upon the 1951 classification: not only was the scheme the best available, but it was specified in great detail (including archaic occupations) in a single volume and had been used by Armstrong who provides notes regarding its modification for use with nineteenth century enumerators' returns.

But if Armstrong's predilection for the 1951 classification seems eminently reasonable the modifications which he proposes are more controversial. Essentially his modifications attempt to meet the problems posed by the distinction between employer and employee, especially in commercial and retailing trades, and to remove minor anomalies. Initially, Armstrong suggests, (ibid., 209-10), the 1951 classification should be modified as follows. "All those described as dealers or merchants in this, that or the other, are best placed in Class III and not in Class II ..... Similarly, all those in retail shop keeping trades ... should also be placed ... in Class III, irrespective of the fact that the 1951 classification would place only salesmen and assistant here, incorporating proprietors and managers in Class II. This should also be done with innkeepers, restaurant keepers etc. This has the initial effect of putting virtually all commercial persons in Class III ... many persons who made their living in these ways ... enjoyed only low standards of living arising out of their commercial operations. The minority described as agent, factor or broker, may still be included under Class II, however, but those distinctively described as street sellers, hawkers, pedlars, costermongers etc. should be consigned to Class V (following 1951 practice)."

Armstrong then advocates alterations to this initial classification "..... upon consideration of individual cases", (ibid., 210). Those employing twenty-five or more (excluding domestics) should be placed in Class I. Any initially allocated to Class III or IV and employing one

to twenty-four (excluding wives, sons, daughters) should be put in Class II. Similarly innkeepers, lodging-house keepers, tavern and beer-house keepers, publicans and eating-house keepers should be upgraded to Class II if they employed one or more domestic servant or assistant other than members of their immediate family. Finally he suggests that drivers of passenger vehicles should be placed in Class III, but carriers and carters in Class IV (to remove an anachronism in 1951 allocations) and proposes a way of handling the few entries of 'occupation' not classified by the Registrar General.

It was argued earlier that maintenance of domestic servants should not be used as a direct measure of socio-economic status: it should be possible (if unlikely!) to reveal that keeping of domestic servants reflected low socio-economic status, or no particular status level at all. It follows that the keeping of a domestic servant by an innkeeper, publican etc. must not be allowed to define the status with which he is attributed. Other employees were used in the way Armstrong proposed however, and all employers of labour (excluding servants, and immediate family) were allocated to at least Class II. Armstrong would not reclassify an individual initially placed in Class V if he were subsequently found to be an employer; this limitation was dropped, but in fact no cases were revealed. Employment of twenty-five or more seems a rather severe criterion for upgrading to Class I; nevertheless the arbitrary nature of any alternative suggested that the figure of twenty-five was as good as any other.

Occupations not classified by the Registrar General were allocated as Armstrong advised (ibid., 211): 'house' or 'land proprietor' or 'owner' to Class I, 'pauper' to Class V etc. Contrary to Armstrong's advise retired persons were not classified on the basis of their previous occupation for in many cases the former occupation was not stated and it seemed desirable to treat all retired persons similarly. Retired people

were therefore grouped in Class X. For analysis of data based solely upon household heads, blank and uninformative entries such as 'housewife' and 'spinster' were also allocated to group X where they referred to the household head; for other purposes, however, they were omitted therefrom.

4.22 Indicants Selected to Reflect Social Class

The basic data collected for each areal unit included the number of individuals who could be allotted to one of the following social classes: I, II, III, IV, V and X. Because of the uncertain contents of Class X, and in view of its consequent dubious relevance to hypotheses regarding variations in socio-economic status, attention focussed upon Classes I to V inclusive. After Class X the next smallest in terms of total number of individuals included was Class I, followed by Class II and Class V. Class IV was generally of at least moderate size, and Class III was large in virtually every areal unit examined. The problem therefore arose that Classes I, II and V were frequently too small for their share of the occupied population to be reliably estimated for small data units. In addition, it seemed undesirable to have five variables relating to social class, especially since this would introduce some of the characteristics of a closed number system, for the proportions in all six classes obviously total 100 per cent.

The value of data regarding Class III was not particularly great as far as hypothesis testing was concerned, referring neither to those of high social status nor to the humblest section of the working population. Instead Class III encompasses those of intermediate status, including both skilled manual workers and those in lower grade white-collar jobs. In view of what has already been said regarding the problems of allocating certain individuals confidently to the correct social class, it also seemed likely that Class III would include some persons more properly placed in Class II or in Class IV had fuller information been available.

Misallocations leading members of Class III to be wrongly assigned to Classes II or IV were probably far less common, and it can be assumed that Classes I and II represent a fairly homogeneous group of 'top people' (even if not quite all those of moderately high status or better are present), while Classes IV and V include a very heavy concentration of the disadvantaged in the community. The two social class variables selected were therefore the proportion in social classes I or II, and the proportion in Classes IV or V. The population upon which these proportions were calculated was that part of all the individuals in the sample population for which the enumerator had recorded a usable occupation. Entries such as 'housewife' were ignored for this purpose, as were the habitual inclusions noted earlier; where retirement was indicated the individual was grouped in Class X.

A similar procedure, adopted by Armstrong (1968, 78-81; 1972, 211-4) who also groups together Classes I and II and Classes IV and V on the grounds that the borderlines between Classes II and III, and between Classes III and IV were far more defined than those between Classes I and II and between Classes IV and V. Though the boundary between Classes IV and V did appear rather vague, such a claim is not made here: it is merely suggested that whereas Class III may have been rather heterogeneous, Classes I and II together were almost exclusively composed of persons of markedly higher status and that they included a very high proportion of all people of such status. A similar argument is applied to the homogeneous low status population in Classes IV and V. Armstrong's other arguments (ibid., 1968, 78-81), that sampling errors are magnified if single classes are taken alone, and that the technique works, are accepted: number of servants was found to decline across the aggregated classes as Armstrong suggested.

Hence two social class variables were adopted to reflect socio-economic status: "the percentage of the occupied population in Classes I or II"; and "the percentage of the occupied population in Classes IV or V".

4.23 An Evaluation of Social Class Measures

Inevitably the practice of different enumerators varied, and often insufficient detail in the description of an individuals' occupations made it difficult to allocate them to particular social classes. While this is an important problem, and one which must be remembered when variable selection is considered, it must be noted that the proportion of the sample population affected in this way was relatively small. A record was made of all decisions, so that - once encountered and allocated - a problematic occupation would always be allocated in the same way. Little purpose is served in listing the enigmatic entries which posed particular difficulties, but a description of recurring problems is desirable for it may indicate the existence of non-random distortions which will need to be considered when interpretation is involved.

Firstly, it became clear that - in some respects - the 1851 census was superior to the following two censuses. In particular, there was a far more consistent record of employers, the number they employed, and the status of particular individuals as 'masters' or 'journeymen'. At least it is presumed that the record in 1851 was more consistent: certainly entries giving such information were rarer in the later censuses. This had the unfortunate effect of inflating the numbers attributed to social classes I and II in 1851, compared with 1861 and 1871. But as aggregate analysis was intended, and because a relatively small proportion of those in Classes I and II in 1851 were there solely as employers, this was not too serious a problem. Many members of Classes I and II fell into these groups by virtue of their occupational description: doctors, iron masters and judges for example. Where status classification depended upon the identification of employers, description of the number employed was not the only source of information. The presence of an apprentice in a lockmaker's household or of a waiter in the household of an eating-house

keeper was sufficient to define an employer: thus the column indicating each individual's relationship to the household head afforded considerable assistance in social status classification.

Secondly, there were difficulties with the social class X which was intended to include all retired persons along with various other problematic individuals. Most of the trouble arose as a result of the general failure of the 1851 enumerators to distinguish retired persons: occasionally the word 'retired' appeared in parentheses following a particular individual's occupation. But the small number who could be attributed to Class X in 1851, and the presence of elderly people recorded as 'locksmith' and even 'blacksmith' suggest that the occupation recorded is that performed prior to retirement (Tillott, 1972, 126).

There was also evidence indicating a more general failure of enumerators, at each of the three censuses under consideration rather than at any single census. The enumerators appear consistently to have adopted a vague terminology when describing occupations. Even if this third limitation could be proved to affect all three censuses equally it would not be wise to ignore it, for consistent vagueness regarding particular occupations may produce an inaccurate definition of the status of populations occupying areas where the affected occupations are dominant. Imprecise description of particular occupations may, for example, lead to misallocation of most of the workers in the industry: all might be placed in the same social class giving a totally erroneous impression of homogeneity and of high (or low) status.

But gaining a general impression from census returns is one thing; demonstrating the validity of that impression is quite another. What was required was detailed evidence of differences in status which are telescoped by occupational descriptions found in enumerators returns. Differences in wage rates among different workers were not hard to find, but specific relevance and direct reference to Wolverhampton was rare.

The nineteenth century Parliamentary Papers appeared to offer the best hope of relevant data, and these were examined at length for the required evidence. The fruits of this labour were small compared with the efforts involved, yet some interesting information was uncovered.

The first item revealed which related specifically to Wolverhampton was in the Annual Reports of the Inspectors of Constabulary and referred to rates of pay amongst police officers. Most of the police in Wolverhampton lived in police "barracks" - the station house - and so were not included in the present study of the urban residential pattern; and the number of policemen was only 69 in 1868 so that even if they had lived in normal domestic premises their contribution to the social structure would have been infinitessimal. But nevertheless it is instructive to note that the precise class of police constable was not stated in cases where policemen were sampled amongst the general population. Yet the weekly pay varied, in 1868 for example, from 18 to 23 shillings (Inspector of Constabulary Report, 1868, 45) representing a variation in annual salary from £46-16s to £59-16s. All 'other ranks' of policemen besides chief constables, inspectors and superintendents are allocated to Class III by the Registrar General (1951, 11) so that a constable in Wolverhampton in 1868 who earned £46-16s and a sergeant who might earn up to £67-12s (Inspector of Constabulary, 1868, 45) would fall into the same social class. This may not seem much of a problem for both salaries are of similar order. By contrast Wolverhampton's Head Constable earned £350 and is placed by the Registrar General into social class II. But so too are Wolverhampton's inspectors earning £87 to £109 annually (ibid.).

Such evidence is rather trivial, despite the detailed wage rates. But additional evidence was discovered in the Reports of the Inspectors of Mines (see for example Inspectors of Mines, Reports 1865, 100-14; 1868, 97 etc.) which include details of accidents in Wolverhampton mines stating the precise job of people killed. The report of 1865 for the

South Staffordshire and Worcestershire Division (ibid., 1865, 100-14) was written by James Philip Baker and is headed 'Wolverhampton, February 28, 1866'. One sentence clearly suggests the great variety of occupational terms and corresponding differences in responsibility and status within mining: "Amongst those who lost their lives there were, 1 colliery proprietor, 2 charter-masters, 2 deputies, 15 collier boys, 30 bandsman, 25 pikemen, 2 bandsmen, 5 sinkers, 3 enginemen, 2 labourers and 4 hookers-on ....." (ibid., 100). The managerial responsibility of the charter master is confirmed later (ibid., 105) as follows. "By your instructions a man named Preston, a charter master employed at Rough Hills Colliery, was summoned for a violation of the special rules in not providing a permanent "tackled ship" and "cover" for lowering and raising persons...." The lists of fatal colliery accidents which follow include two more specific references to Wolverhampton mines and relate to the deaths of an 'engineman' aged 36, and a 'pikeman' aged 61. Similar lists for 1866 (ibid., 1866) include four Wolverhampton fatalities: a 'banksman' aged 17, a 'gin driver' aged 13, a 'miner' and a 'pikeman'. For 1868 (ibid., 1868) the list runs a 'collier boy', a 'bondsman' (sic) and a 'miner' aged 13. Finally, a brief passage suggests the roles of the various employees at a coal mine (ibid., 97). The extract relates to an accident at "..... Ettingshall Colliery, belonging to H.B. Whitehouse, Esq. The pit ..... was at that time in the possession of and worked by a charter master ... who ... on the morning of the accident did not as usual reach the pit in time to arrange with and see the workmen descend. The deputy ..... took the workmen down the pit and commenced operations, leaving two "boys" under 15 years of age in charge on the pit bank, contrary to the provisions of the statute. ..... As these "boys" were engaged at the mouth of the pit-shaft, the gin driver, the younger of the two, fell down the shaft and was killed ....."

Evidence regarding the wage levels of these different mining jobs is very difficult to come by; for the 1870s no useful information was discovered, but the First Report of the Midland Mining Commission (1843) covers South Staffordshire in detail and makes frequent reference to Wolverhampton. A considerable amount of interest focussed upon the earnings of the so-called "butty" who was the middleman and agent for the pit owner and therefore ran mining operations. 'Butties' invariably understated their earnings, while owners may have exaggerated the amount that would remain to a 'butty' after he had met the various overheads for which he was responsible. In the Appendix to the Report answers to several questions are recorded. A Ground Bailiff considered that "a butty ought to get £2 a week if he attends to his work, for he has many outlays with horses etc., and is subject to many other losses. Some of the butties get their £5 a week". In similar vein a coal owner and agent stated that "mines vary, but in a good pit, the butties' profits are from £5 to £10 when all is paid; some weeks more and some less". By contrast butties gave a different impression of their earnings: "I have not got more than a bandsman's wages nor so much. I have not got so much as a pound a week. Where the mine is regular the butty would be better off, especially if free from water". Another replied "I do not get a guinea a week. I have had a difficult pit these last six years". Daily rates for other mine workers are also suggested. "My pikemen have had 3s up to the last three weeks; bandsmen, some 3s 6d, some 4s." Assuming a six day working week, the pikeman's 18s and the bandsman's 21 or 24s compared well with the earnings of a police constable over twenty years later. Admittedly mining employment was cyclical with a threat of unemployment, but it does not seem unreasonable to group miners and policemen together in social class III. The butty or charter master, however, probably earned £2 to £5 each week and

performed a responsible job involving employment of labour, taking of decisions, and management of mining activity. If a police inspector earning around £2 a week in the 1860s can be regarded as a member of Class II, surely the butty or charter master should be similarly treated, for both men had authority over workers placed in Class III.

Unfortunately, however, enumerators appear to have used the term 'coal miner' or even simply 'miner' to describe all the different grades of pit worker. Occasionally a miner was placed in Class II because an apprentice was present in his household, but he was generally attributed the occupation 'miner' - as was the apprentice. Similarly, a considerable number of young boys were listed as 'coal miners' while the evidence presented above suggests that they often acted as gin drivers or worked on the pit bank. No attempt was made to modify the social class attributed to such boys, but the undoubted result was to allocate many persons performing semi- or un-skilled work to social class III. It seems likely that there was a similar problem regarding the allocation of men listed as 'lockmaker' for some of those attributed to Class III had servants more consistent with Class II. This probably arose from the undoubted practice of certain lockmakers to deal in locks and put work out to others; in many cases the lockmaker and dealer was listed as a 'lockmaker' just as his outworker might be. Trade Directories leave no doubt on this point. The problem was probably not confined to lockmaking for the First Report of the Midland Mining Commission (1843, xxiv) states that the hardware trade was "chiefly in the hands of ..... factors, who reside at Birmingham and Wolverhampton, and go about the country and give orders to the different workpeople according to the trade list of prices".

Considerable space has been devoted to a discussion of the limitations of the data regarding social class. This must be balanced by a recognition

that in the vast majority of cases no problems arose. Many hundreds of examples might be cited in which classification seemed not merely appropriate but ideal. Household heads allocated to Class V often had wives and children in lowly occupations too, while heads placed in Class I had several servants, lived in named residences and were listed as employers of large numbers. The general impression of the classification, whilst it was in use, was that it worked and worked well. A very large proportion of those placed in Class I were found amongst the "Gentry and Clergy" or "Private Residents" listed in contemporary trade directories. At the opposite end of the social scale those in Class V often lived in properties listed by the enumerator as part of a court, or in a "back house". None of these incidental items of information was allowed to affect the classification procedure but they did confirm that it was functioning effectively.

It has been demonstrated that the occupational description provided by the census was sometimes imprecise and led to a rather generalized allocation to social classes. It must also be conceded that - especially when Classes I and II or Classes IV and V are grouped together - this is often what was wanted. Perhaps a charter master should have been grouped with a police inspector in social class II, but even here there is room for debate - the former occupation being far less "respectable" in Victorian eyes than the latter. Moreover, charter masters were so classified in cases where an employee or apprentice was clearly identifiable in their households.

The balance of evidence strongly suggests that allocation to social classes was <u>very largely</u> successful.

4.24 <u>Domestic Servants</u>

Problems in calculating the number of domestic servants in a household were <u>very</u> rare. Nevertheless a few minor difficulties did arise. At first

it seemed likely that individuals listed as gardeners or nurses might pose problems but this was not the case. Gardeners were treated as domestic servants only when their relationship to the household head was given as "gardener", "servant" or equivalent; a similar rule applied to nurses. Other gardeners were regarded as market gardeners (nurses as medical nurses) who happened to be living in the household concerned. It is admitted that a few might have been domestic servants of other households, but since they would not be resident there was no intention to count them, and the data under consideration here were not affected adversely. (A minor distortion of occupational classification is conceded, but numbers were very small.)

Households of a commercial character did cause some difficulty, as has already been admitted. A cook and a domestic servant living in the house of a lock manufacturer employing forty men clearly indicates his high status; the same entries within the household of an eating-house keeper may merely imply that employees lived on the premises. Because of this it was necessary to adopt an arbitrary convention that, in the absence of evidence to the contrary, persons listed as "domestic servant" or "servant" in commercial households be treated as genuine servants while all other entries are interpreted as employees. Serious difficulty was rare and many enumerators provided additional information making the position clear. Entries such as "servant (in shop)" or "servant (waitress in eating rooms)" were found, and even the columns listing relationships to the household head sometimes proved illuminating: a "servant", for example, being described there as "shopman" or "porter" of the household head. Similarly, servants listed as lodgers were not regarded as household servants.

The only other problem regarding domestic servants related to the population upon which proportions should be calculated. The alternatives

seemed to be the total number of households, and the total number of households with servants. The latter was ultimately rejected on several grounds. Firstly, no household which has servants can have less than one servant, so that the value of the variable "mean number of servants in households which keep servants" tended to concentrate very heavily on the values marginally above 1.0 with only the higher status areas having significantly larger values. By contrast, the mean number of servants per household (based on total number of households in the area) was far more normally distributed. Secondly, the number of households with servants was very small in certain areas so that it was impossible to derive a reliable estimate of the mean number of servants in households which kept servants from a small sample. Estimates of the mean number of servants based upon the total number of households were likely to be more reliable. Finally, it was felt that the range of values which this method provided (from almost zero to two or more) was a far better measure of the status of an area's population than that offered by any alternative. Hence "mean number of servants per household" (based on the total number of households in the area) was selected as the indicant of status.

4.25 Child Employment

Problems with the measurement of child employment were rare, but certain difficulties merit attention.

Certain "occupations" attributed to children did not indicate employment: "scholar", "pupil" etc. often formed entries in the occupation column and their meaning is clear. Other entries posed greater problems. "Domestic servant", "domestic servant (at home)", "helps at home", and "works at home" all provide room for considerable debate. All four may indicate that the child merely helped with housework, and so should not be considered as gainfully employed and contributing to

the family income. Alternatively, "domestic servant" may be construed as suggesting that the child went out to work as a domestic servant elsewhere, and "works at home" might be held to suggest participation in a domestically organized activity such as lockmaking if this was the father's occupation. Since child employment is posited as a measure of social status it may be thought that this matters little. Low status is, according to this argument, indicated not only by the child's being sent out to work but also by the idea that the child must perform any domestic duties at all. The middle class man would not - it is argued - regard his child as a domestic servant. Unfortunately the argument misses the point. Recording children as "domestic servants" or "helps at home" seems to have been a habit of some enumerators rather than a genuine reflection of the parents' views of the role of the child. To treat all such cases as working children would be very misleading. Indeed some enumerators list every child and every woman with some "occupation" - at least for the first few pages of the returns: hence a six month old baby might be recorded as a "locksmith's son". Here the meaning is obvious: the enumerator had attributed every individual with an "occupation". But the same entry applied to a fourteen year old is more ambiguous: clearly a definite occupation <u>is</u> implied if the particular enumerator did not habitually make similar entries where they are wholly inappropriate.

The procedure eventually adopted involved scrutiny of the complete returns of each enumerator. Entries ignored because they did not, or need not, imply any contribution to the domestic budget included "scholar", "domestic servant" and "works at home". Entries such as "farmer's son" were accepted at face value so long as the enumerator concerned did not habitually list such occupations, and providing that <u>no</u> child under five years old had been so recorded.

Initially it was intended simply to estimate the number of children within an area who could be considered to be making a contribution to the household budget and to express this number as a proportion of the total number of children within the area concerned. Children would then be defined as all persons below fifteen years of age. Unfortunately, conditions in the nineteenth century were so different from those of the present day that this did not appear to form a measure of poverty or low socio-economic status. A considerable number of Class II households included such working children, and often the presence of the working child was directly responsible for attribution to Class II! Apprenticeship was the major form of industrial training at this time so that boys of ten to fifteen were often recorded as occupied, and often lived with the master craftsman to whom they were apprenticed.

It was clear, however, that redifinition of 'children' offered a partial solution. If only children of the household head and the head's spouse were admitted, then far fewer apprentices were incorporated in the sample; while some craftsmen did train their own children in their trade, many preferred to send them to school. Once this change had been made it became possible to remove the age limit on 'children' and so <u>all</u> children of the head or head's spouse who were still living with their parents and were unmarried could be considered. This permits critical examination of Harrison's contention (1973, 142) that older children of middle class parents remained financially dependent on their father until they had begun to make their way in business or, if girls, had married. But to ensure that the older 'children' did not confuse the issue unduly, two separate age groups were distinguished. It was not felt appropriate to express the variable in the same way as domestic servants had been treated, for "mean number of children working per household" would vary with the proportion of households containing children.

(a function of the family status dimension) as well as with the prevalence of child employment (the required socio-economic status element). As confusion of the two dimensions was unacceptable, the total number of children in the age group concerned was taken as the base population upon which percentages were calculated. Hence the two indicants adopted were "the percentage of heads' children aged 5-14, working" and "the percentage of heads' children aged 15 or more, working".

4.3 Census Data Classification And Problems Of Reflecting Occupation

4.31 The Classification of Occupations by Industry

The need for a broad set of industrial groupings against which occupational segregation might be measured was far less contentious. Nineteenth and twentieth century classifications were found to be broadly similar, making choice difficult. Though there was rarely any doubt regarding the group appropriate to a particular job, it was again decided to opt for a classification furnished with a printed list of occupations alphabetically arranged and allowing problems to be resolved simply. For logistic reasons it was necessary to abstract the data for the analysis in two "runs" through the census returns, and it was therefore decided to use two different occupational classifications so that these might be compared before a final choice was made.

The two classifications selected for such testing were respectively a detailed twentieth century one (Registrar General Classification of Occupations 1951) and a less elaborate nineteenth century scheme used by Booth (described by Armstrong, 1972, 228-52, with an alphabetical listing 296-310). Neither proved ideal, as it stood, for application to nineteenth century Wolverhampton; all modifications were designed to be reversible, and were achieved by recognizing subsets wholly within one category of the published classification, which could then be transferred from group to group at will.

It was recognized at the outset that the Registrar General's Classification was far too detailed for application to a small sample population, and the operational version was based on the 28 main groups or Orders. These were augmented as necessary to provide for "occupations" recorded by enumerators but not recognixed by the Registrar General or not suitably treated in the published scheme. Thirty classes were eventually recognized, as described in Table 4.1.

Two types of problem arose with this modified classification. First, certain Orders were far too large. Order 06, for example, embracing 'workers in metal manufacture, engineering and allied trades' included nearly 36% of household heads in 1871. Though subdivision was required, The Registrar General's sub-Orders were too detailed and did not meet the specialized needs of Wolverhampton. Finally, three particular occupational types were recognized within Order 06: lock and key making, non-ferrous metal trades, and manufacture of named products (pen nibs, coffee grinders, steel rules etc. but excluding locks and keys). Order 03 (mining and quarrying) was similarly treated, though less successfully, with iron ore (or ironstone) mining and quarrying (or stone mining) separately recognized. The second group of problems concerned the Orders themselves and so proved far more serious. Order 16 (administrators, directors, managers not elsewhere specified), Order 23 (clerks, typists etc.), Order 26 (workers in unskilled occupations not elsewhere specified) and Order 27 (other and undefined workers) all departed from the industrial-grouping approach to occupational classification demanded by the theory under consideration. Managers in mining and in engineering were not, by the Registrar General's procedure, grouped with the appropriate industry but in a separate category of their own containing no one below social class II. To remedy this, all managers were allocated to the appropriate industry when this was stated; clerks, unskilled workers etc. were

Table 4.1 Occupations of Household Heads in Wolverhampton 1841-71: the Registrar General's Classification (Modified)

Occupations	% of Household Heads included in 20% Sample			
	1841	1851	1861	1871
Fishing	0.00	0.00	0.00	0.00
Agriculture, Horticulture and Forestry	2.89	3.48	2.62	2.07
Mining and Quarrying	9.70	8.38	6.36	4.00
Treating Non-Metal Minerals (brick, glass, lime etc. making)	0.29	0.84	0.33	0.44
Chemicals, Coal Gas etc.	0.07	0.16	0.12	0.55
Metal Manufacture, Engineering etc.	32.44	30.87	32.28	35.88
Textiles	0.51	0.47	0.42	0.33
Tanners, Leather Goods, Fur Dressers erc.	3.69	2.90	2.41	3.22
Makers of Textile Goods and Clothes	3.33	2.79	2.78	2.44
Food, Drink and Tobacco	1.30	1.74	1.66	1.55
Wood, Cane and Cork Workers	4.71	4.74	3.78	3.52
Paper Makers, Printers, Book Binders etc.	0.15	0.37	0.46	0.26
Makers of Products (Not Elsewhere Specified)	0.51	0.95	0.46	0.92
Builders and Contractors	2.46	5.27	3.94	3.59
Painters and Decorators	0.72	0.53	1.29	1.74
Adminstrators, Directors, Managers (Not Elsewhere Specified)	0.51	1.10	0.75	1.07
Transport and Communications	2.17	4.11	6.06	5.71
Commercial, Finance and Insurance (Excluding Clerical Staff)	6.23	8.11	9.22	10.23
Professional and Technical (Excluding Clerical Staff)	2.32	2.42	1.62	1.89
Defence Services	0.00	0.11	0.58	0.63
Entertainment and Sport	0.00	0.16	0.25	0.07
Personal Service	4.42	6.42	6.40	6.08
Clerks, Typists etc.	1.38	2.69	2.62	2.41
Warehousemen, Storekeepers, Packers etc.	0.22	0.53	0.42	0.78
Stationary Engine Drivers, Crane and Tractor Drivers, Stokers etc.	0.00	0.05	0.08	0.00
Unskilled Occupations (Not Elsewhere Specified)	8.40	4.48	5.32	1.89
Other and Undefined (Includes Gas, Water and Electricity Distribution)	0.72	0.32	0.25	0.59
Retired, Pensioners, Independent, Fund and Property Holders etc.	4.78	1.95	1.87	2.29
Unemployed, Paupers etc.	0.07	0.21	0.08	0.44
None Stated	6.01	3.85	5.57	5.41
TOTAL	100.00	100.00	100.00	100.00
	n=1381	n=1898	n=2407	n=2698

similarly treated and the size of Orders 16, 23, 26 and 27 is partly a function of the detail furnished by enumerators (permitting or preventing such reallocation). Table 4.1 shows the data provided by an application of this classification to household heads. Orders 16, 23, 26 and 27 fulfil a useful function in providing "pigeon-holes" for the many imprecise occupational descriptions offered by enumerators.

Dissatisfaction with these aspects of the Registrar General's classification, and its excessive detail, led interest to focus on Booth's nineteenth century scheme. The Booth/Armstrong Classification proved far more suitable for the purpose at hand.

Booth's nine principal industrial divisions of the occupied population were supplemented by a 'property-owning/independent' class, an 'indefinite' category, and a 'dependent' group - following Booth's example. The twelve divisions so derived provided a far more simplified classification (see Table 4.2), and one which permitted easy classification of the whole population. Modifications were necessary, but were generally minor. Booth includes 'locksmiths' in the 'building' category, whereas - in Wolverhampton - they were principally manufacturers and formed an important occupational group. A special category was therefore recognized including all locksmiths; this was added to the 'building' class for comparison with Booth's data, but was more usually treated with 'manufacturing'. Booth's 'industrial service' category proved unsatisfactory (cf. Order 26 described earlier) and 'general labour' was redistributed to other classes when the enumerator's description permitted. Apart from these two alterations, Booth's system was applied exactly as described by Armstrong (1972, 228-52 and 296-310). Indeed one of the major limitations of Booth's classification proved a distinct advantaged compared with that of the Registrar General. The latter requires a clear distinction between manufacturing and distribution which is impossible in the nineteenth century.

Table 4.2 Occupations in Wolverhampton 1851-1871: the Booth/Armstrong Classification

Occupation	% of Total Population of 20% Sample of Wolverhampton Households		
	1851	1861	1871
Agriculture	1.47	0.92	0.61
Mining	4.33	2.67	1.30
Building[+]	5.83	4.37	4.08
Manufacturing	17.86	17.76	20.06
Transport	1.50	1.88	2.22
Dealing	4.70	5.45	4.85
Industrial Service	2.13	2.67	1.55
Public Service and Professional	1.11	1.09	1.49
Domestic Service	6.20	5.50	5.07
Property Owning	0.43	0.31	0.41
Independent	0.08	0.10	0.10
Dependent	54.36	57.28	58.26
(Locks[+])	(2.24)	(1.84)	(1.48)
TOTAL	100.00	100.00	100.00
	n=10230	n=12414	n=13662

[+] Building includes Lockmakers shown separately at the foot of the table.

By contrast Booth groups some dealers in particular materials with 'manufacturing', while his 'dealing' category includes "only a relatively restricted range of retail trading in coals, raw materials, clothing materials, dress, food etc." (ibid., 231). If Booth's treatment is arbitrary it must be recognized that only by arbitrary allocation can the Registrar General's system be made to work at all: far more retailers were manufacturers, far more manufacturers dealt in raw materials or finished products than is the case today. For these reasons, together with the other limitations of the Registrar General's approach already described, Booth's classification was felt to conform more precisely with the needs of the present study.

4.32 Indicants Selected to Reflect Occupational Patterns

Although Booth's classification had been extended by inclusion of 'property owning/independent', 'indefinite' and 'dependent' categories, none of these was relevant to the testing of hypotheses about occupational segregation. The composite nature of the 'industrial service' grouping ruled it out too, leaving only eight categories from which the final variable set could be selected. 'Agriculture', 'building', 'transport' and 'public service, professional' were all omitted because they included too small a number of people for their importance in small areal units to be adequately estimated on a sample basis. Finally, 'domestic service' was inadmissable because a very similar variable was to form a measure of social status. Three variables remained: the proportions of the total population engaged in manufacturing (including locksmiths), in mining, and in dealing. These three formed the indicants of occupation: "percentage of sample population in manufacturing occupations", "percentage of sample population in mining occupations" and "percentage of sample population in dealing occupations".

4.33 An Evaluation of Occupational Indicants

Though occupation posed fewer problems than social class it is still necessary to examine the suitability of census data for the present analysis. Vagueness again caused difficulty: terms like 'clerk' and 'labourer' defy allocation to particular industries so introducing distortions absent when entries such as 'railway booking clerk' and 'foundry labourer' predominate. The major disadvantage of vague terms lies less in deciding how they should be treated (for the first decision becomes a precedent), and more in the consequences which these decisions have. By treating every 'labourer' in the same way, occupations such as mining - in which the labourer may have worked - tend to become overweighted with more skilled men. A similar problem applies to labourers and to clerks employed in manufacturing, railway and other sectors. The result may be a spurious link between social class and occupation. This possibility is greatest in the Registrar General's classification; at least the Booth/Armstrong scheme places unspecified 'clerks' and 'labourers' in the same category ('industrial service') instead of exaggerating the polarization.

This may seem a very serious problem. Clearly if many labourers in mining and manufacturing could not be correctly allocated to the industry in which they worked, then the remainder - who were allocated to those occupational categories - would tend to be of higher status than the average worker in the industry. Miners might then appear to be of relatively higher social status than was, in fact, the case - producing a spurious link between a particular occupation and relatively high social class. Examination of the results of the analysis do not, however, confirm these fears. Areas in which there were relatively high proportions of miners were generally also characterized by many in the low social classes. The reason for this lies in the method of analysis.

Components and factor analyses do not examine individual correlations but ecological (area-based) ones. Even if most of the unskilled miners were recorded as 'labourers' and therefore grouped as 'industrial service' the areas of mining employment would still have a high proportion of their population engaged in mining and would also have large numbers in the lower social groups. An ecological correlation between mining employment and low social status does not imply that miners were of low social status but that areas with high levels of mining employment tend also to have large proportions in the lower social strata.

This is more than a mere technical loophole for the poor data because it also expresses something of the reality of the nineteenth century world. Those of the very lowest status were often 'general labourers' just as recorded in the census returns. They held no affiliation to a particular industry but sought heavy unskilled work wherever it was available. For this reason, it could be argued, the enumerator was being accurate rather than vague in his characterization of occupation. Perhaps such a view is exaggerated - for clerks tended to work for one employer for far longer yet they too receive no industrial descriptor in some cases. Nevertheless the case merits examination. First it must be noted that the problem was far less common where clerks were concerned so that vagueness of description may not have been general. Second, and most important, there are numerous examples of pencil (and sometimes ink) additions to the initial occupation: in some cases 'labourer' becomes 'labourer (iron)' or 'labourer (railway)' but in many cases the word added is '(general)'. It seems unlikely that an enumerator, or anyone else, would go to the trouble of making such amendments if they were merely an admission of vagueness. For this reason, and because of the reliance upon ecological correlation it does not appear that imprecise descriptions of occupation form an insuperable barrier to analyses based on census returns. Table 4.2 shows how small the area of doubt really was.

Other difficulties were largely trivial. The entry 'uckster' proved puzzling at first, but the same enumerator also recorded several 'inge makers'. Clearly the letter 'h' - often unvoiced locally - had been omitted, and the huckster was treated as a hawker. All dual occupations ('publican and miner', 'carter and coal merchant') were arbitrarily treated as the first listed occupation. In general there were few difficulties, though some concern was felt about the number of individuals recorded as unemployed or retired; both were very small and under-recording is highly probable. This, however, is not likely to have materially distorted the pattern of occupational segregation and it was concluded that the census returns did furnish data suitable for a factorial ecology.

4.4 Summary: Variables Selected

The census returns were found to yield adequate measures of both socio-economic status and of occupation. The indicants chosen for the analysis were as follows.

01 Percentage of occupied population in classes I or II.
02 Percentage of occupied population in classes IV or V.
03 Mean number of domestic servants per household.
04 Percentage of heads' children aged 5-14, working.
05 Percentage of heads' children aged 15+, working.

24 Percentage of sample population in mining occupations.
25 Percentage of sample population in dealing occupations.
26 Percentage of sample population in manufacturing occupations.

Many of these indicants might have been expressed slightly differently and, in addition, other variables might have been adopted to reflect socio-economic status and occupation. It is not therefore claimed that the variables listed above are the only possible indicants, nor is it claimed that the variables chosen are ideal in all respects. Nevertheless it is argued that, taken together, the eight measures listed adequately reflect the theoretical socio-economic and occupational dimensions as described in Chapter 2.

CHAPTER 5 INDICANTS OF FAMILY STATUS AND OF HOUSEHOLD STRUCTURE

5.1 The Nineteenth Century Background

5.11 Industrialization and an Independent Family Status Axis

The changes often held to explain the emergence of an indpendent family status dimension (McElrath, 1968; Abu Lughod, 1969) may be briefly summarized as follows. Before industrialization an elite group alone were able to support extended family patterns so that social status was a very good predictor of family structure. Industrialization encouraged the separation of home and workplace, and the decline of extended family patterns. The nuclear family therefore emerged at all status levels making social status a poor predictor of family structure. The nuclear family was subject to life-cycle variations in composition so that family structure began to vary independently of status. These changes were reinforced by the exercising of choice, as birth control and improved opportunities for female employment permitted the emergence of non-familist value orientations. Starting in the upper strata, there was an increasing freedom to choose between the pursuit of traditional family goals and the pursuit of career or consumption. Clearly, non-familist value orientations imply family structures characterized by lower fertility and fewer children, whilst female employment is more common. Hence variations in family structure independent of social status were linked not only with life cycle variations but also with differences in fertility and in female employment levels. Differences in family composition led to different house-space requirements and environmental preferences so residential segregation according to family status began to emerge. For this reason, the dominance of single family dwelling units (as opposed to flats and subdivided property) is sometimes used as an indicant of familist orientations.

Unfortunately these generalizations are at variance with the changes experience in nineteenth century Britain. First, the extended family

pattern had ceased to characterize the upper echelons of society long before the industrial era. Greenfield (1961) documents the diffusion of the nuclear family without industrialization and points to its existence outside the industrial world (see also Lewis, 1965, 498). Sjoberg (1965, 217) even suggests that industrialization improved the material well-being of the lower status groups so that they were able to adopt the (pseudo-) extended family patterns that had so long eluded them. Anderson (1971) admits the possibility of pseudo-extended family patterns amongst the poor in response to economic necessity, and Harrison (1973, 75) describes the situation in early Victorian Britain as follows.

> "..... when a labouring man turned ..... fifty (and in heavy jobs much earlier) his strength and quickness began to desert him ..... With no provision for an income, unable to continue with his job, and in failing health, the most he could hope for himself and his wife was the corner by the fireside in his children's home in return for such odd jobs and baby mindings as they could manage."

Secondly, female employment in the nineteenth century was more an expression of economic necessity than of an orientation towards non-familist goals. It was generally the women of the labouring poor who worked, and they were forced to work in order to eat (Best, 1973, 119).

But these and other objections must not be taken to imply that hypotheses suggesting the gradual emergence of an independent family status dimension (combining elements of family composition, life cycle, fertility and female employment) are wholly inappropriate in the nineteenth century context. First, the nuclear family was certainly on the ascendant in the period of rapid industrialization. Section 5.12 is therefore devoted to a re-interpretation of existing ideas emphasizing differences in household complexity between the classes in the late pre-industrial situation. The emergence of an independent family status axis is then associated with a decline of household complexity (rather than of extended family patterns) among upper status groups. Secondly, a new value system placing less emphasis upon familism than upon the achievement of expected levels of

consumption did begin to emerge in the nineteenth century. A decline in fertility amongst the middle classes has, for example, been isolated (Banks, 1954) and is attributed to the desire of the middle classes to protect their living standards and rising expectations against increasing living costs. Such changes probably began in the study period, and Section 5.13 therefore examines the ways in which they contributed to the emerging family status dimension. Since major changes in fertility and female employment patterns probably post-date the study period it might be argued that attempts to measure their significance are inappropriate. This was not felt to be the case, however, for it is necessary to establish the importance of these variables at all stages in the industrializing process before the nature of the temporal evolution can be appreciated.

5.12 Household Complexity and the Family Status Dimension

Earlier doubts about the link between industrialization and the demise of extended family patterns were confirmed by an extensive literature. Parish and Schwartz (1972), for example, examine nineteenth century France and affirm that nuclear families existed over most of northern France, if not most of Europe, before industrialization. Litwak (1960) shows that industrialization and extended family patterns are not wholly incompatible - as is sometimes claimed - for extended family relations can be maintained despite the differential mobility of industrial society, and may even encourage mobility on the upswing of the career. Goode (1964, 85) makes a similar point. "True enough, the lower-class family member was less encumbered by a large kinship network if he could rise in the social hierarchy, but this was a doubtful blessing, since a young man from a higher class family, though perhaps limited more by kin in his choices of job, location, or wife, could also obtain benefits from them." The extended family may not, therefore, be as incompatible with industrialism as has sometimes been suggested, and may have formed an important aspect

of working class or immigrant adaptation to the pressures of the harsh urban-industrial environment. This possibility is clearly recognized by Anderson (1971) in nineteenth century Lancashire. He describes a "short-run instrumental orientation to kinship" (ibid., 176) in which functional kinship relationships between two kinsmen are most likely if both have resources inadequate to solve their problems alone and when neither can find alternative suppliers (of social welfare, accommodation, and information) at lower personal cost (ibid., 170-1).

Clearly the initial view of the emerging family status axis is inadequate. If the extended family, with married sons and their fathers in one household, died out before industrialization there could have been no association between high status and extended family patterns in the late pre-industrial city. Further, if pseudo-extended family patterns arose amongst the urban poor as a result of the strain imposed by industrialization, the industrialization saw an increase, rather than a decline, in the link between status and family structure. Fortunately the elements of a solution are apparent in the work of Parish and Schwartz (1972) and that of Anderson (1971) for both focus upon the household as the unit of analysis and both investigate the conditions which would give rise to or maintain a complex household structure. These two essential ideas may be transferred to the nineteenth century census returns for Wolverhampton: the household is, operationally, a far more suitable unit of analysis, and description of changes in household complexity analogous to the hypothesized modification of family structures is also feasible. What is required is a specification of the pre-industrial household complexity pattern as this was related to status, and an explanation of the evolving dissociation between household complexity and socio-economic status. Simply, it is suggested that in the pre-industrial city the high status population tended to have far more complex households than the working

classes; during industrialization this neat arrangement was upset, and then gradually replaced by modern complexity patterns which are a function of life cycle and value orientations rather than of social class. The dissociation of economic and "family" status dimensions then becomes a question of the changing relationship between status and household complexity, and this evolving relationship may be seen in terms of the conditions tending to foster complex household structures. In a domestically organized economy where extended family patterns had largely disappeared, those of higher status tended to have more complex households than did the working classes. Whereas a working man's household contained only his immediate family, that of a master craftsman might have included apprentices, journeymen and servants. Only high status households would have included servants and employees. But the factory system ended all this, making the nuclear family common to upper and lower status households alike: employees disappeared first, but ultimately servants also became rare.

Despite the concentration of manufacturing into factories, the complex household pattern of the upper status groups may have persisted for a considerable time. All manufacturing trades did not succumb to the factory simultaneously; Allen (1929) describes the small scale domestic organization of many Black Country metal trades in 1860; so, in some branches of manufacturing, patterns of domestic industry persisted longer. The city centre retailing, wholesaling and service trades may have escaped such changes for a considerable time: the increased scale of production did not necessarily imply a separation of residential and distributional activities. This may have been important, for a considerable proportion of the upper-middle classes of the pre-industrial city were found in retailing, dealing and commercial occupations. In these circumstances, the link between socio-economic and family status dimensions would only have been dissolved when one (or more) of three conditions obtained.

Either the upper status dealing community must have decided that some separation of home and workplace was to their advantage too, or the composition of these higher status groups must have moved away from dominance by domestically organized dealing towards the more modern white collar office and commercial occupations, or else the lower social strata must have achieved greater levels of household complexity. The first two alternatives were not achieved rapidly, and though immigration increased lodging amongst the urban poor it was never sufficiently widespread to produce similar levels of complexity in households of all social classes. Radical change was therefore unlikely and dissociation of socio-economic and "family" status axes is likely to have taken a considerable time. The position during industrialization is of particular interest.

Assuming that the extended family had almost disappeared but that some form of domestic business survived, then other household forms may have developed. A high status household engaged in trade in the town centre would be able to support domestic servants, shopmen and manufacturing employees in addition to the head's nuclear family and any member of the wider kinship network who might be present. Such a high degree of household complexity would be impossible for those in the lower classes amongst whom possession of servants or employees was an extreme rarity. This contrast by status in the levels of household complexity may offer an explanation of the initial coincidence of economic and "family" status axes so that the pre-industrial pattern may have been dominated by high status households of great complexity. Industrialization saw the gradual erosion of this system, but the link between status and complexity lingered in the city centre dealing and trading community where economic activity continued to be domestically organized. But rising manufacturing production and rising population implied increased retail turn-over and greater commercial land values in the city centre. Coupled with the declining

residential attractiveness of the central area the growing commercial values led traders to foresake the city centre for suburban residence. Once this began to happen the reason for complex households began to disappear: domestic organization of retailing and commercial trades was waning. Slowly, therefore, household complexity began to decline amongst the high status trading and dealing community, and as this happened socio-economic and "family" status dimensions gradually diverged.

The development of lodging and multiple occupancy in nineteenth century Wolverhampton tended to blur class differentials in household complexity; both high and low status households included many individuals unrelated to the head or head's spouse. The distinctive structure of high status households was not completely lost, however, for lodging and multiple occupancy amongst the lower class groups involved the sharing of a house - in many cases - by more than one family; no such multi-family pattern characterized the complexity of upper status households. Servants and employees rarely lived with a family of their own; lodgers often did. It also seems possible that lodging and multiple occupancy amongst the poor were dominantly immigrant traits so that high levels of complexity amongst the lower strata may have been an aspect of ethnicity rather than of family status.

5.13 Female Employment and Changes in Fertility

Given life cycle variations in family composition the youthful pre-marital stage will be one of low fertility and high female employment; middle-life may be characterized by many children and less female employment; to the extent that women outlive men, later life may be a period of low fertility and high female employment - children have left the parental home and widows may be obliged to work in order to eat. Although the nuclear family, with its life cycle variation, may therefore imply particular fertility and feminist elements, such a view understates the complexity of

social change suggesting a false uni-dimensionality of events. Female participation in the labour force did not rise immediately and as a direct consequence of changes in family and kinship organization resulting from the separation of home and workplace. Hunt's example (1965) of modern Japan shows how cultural values may maintain very low rates of female occupation in an industrialized society. Moore (1965, 63) states that where "the family persists as a productive unit ..... women are likely to have economic roles poorly recorded in census data .....", but as "production (except for self-consumed services) increasingly moves out of the household, the strictly productive role of women generally decreases. Subsequent changes in family patterns, such as limitations on child-bearing, and developments in education whereby the school becomes the daytime custodian of children, make a rising rate of female labour force participation probable."

Evidence for the nineteenth century suggests that the decline in female employment began late. "Women", Best G. (1973, 119) writes, "continued to labour during the fifties and sixties in much the same ways and proportions as they had laboured from time immemorial." His data for females aged 15 and above 'at work' in England and Wales shows that a slightly increasing proportion of the female population was working between 1851 and 1871; only in 1881 does a drop occur. Examination of 20% sample data for Wolverhampton reveals a decline, between 1851 and 1871 both in the proportional importance of women in the working population (from 24.8% to 23.9%) and in the proportion of all females working (from 22.3% to 19.6%), but this is largely due to the declining proportion of women employed as domestic servants. Ignoring domestic service the proportion of women working remained steady (13.2% - though only 12.8% in the 1861 depression) and the proportion of women in the working population rose from 16.4% to 17.5%. 'Feminism', as a component of

the family status dimension, may thus postdate our period; female employment levels (high amongst the labouring classes) had first to fall, and fertility to decline before large numbers of women began actively to want to work.

It has already been argued that the emergence of an independent family status dimension must have been a gradual process, depending on the declining complexity of upper status households. If the adoption of birth control is admitted as another factor which, by facilitating non-familist life styles, contributed to the family status axis, then its dissociation from the socio-economic status axis must have been very slow indeed. It is often argued that contraception was accepted first by the upper strata, only significantly affecting the lower classes much later (Freedman, 1961-2; Banks, 1954). Hence non-familist value systems reflected by low fertility and high female activity rates would initially be an upper-middle class phenomenon. It is improbable that this was the case in mid-Victorian England, for it conflicted with the middle class conception of a woman's role. "The woman of the more prosperous part of the middle class may ..... be seen in her public duties of raising children, issuing orders to servants, wearing uncomfortable clothes and chatting with relatives and acquaintances at teatime" (Osborne, 1970, 141). Labour force participation by significant numbers of middle class women is dominantly a twentieth century development. Women did (not) work in nineteenth century England, but rarely from choice as a reflection of a non-familist value orientation. We are forced to conclude that if the family status dimension includes life style elements based on alternative value systems then its emergence - in a complete form - must have been long delayed. Female emancipation was an agonizingly slow process.

What of the women who were obliged to work? Certain situations seem likely to have fostered female employment. If production were

still a domestic activity, despite its integration into the widening economic system, women might continue to help their husbands in the family business; indeed this became essential if middlemen, who supplied materials and collected output, chose to exploit their power by giving very low prices. Such a story of exploitation, obliging wives to work if the family was to earn enough to eat, is exemplified in countless of the Black Country small metal trades and particularly in Dudley's nail making industry (Davies and Hyde, 1971). The development of factory employment amongst the urban poor could have similar consequences, with considerable female employment. As with domestic industry this might be traditionally based as but the extension of domestic arrangements into a new, bigger and separate building. Osborne (1970, 141), for example, refers to "the early factories, in which the entire family worked ....." But as technology developed, exploitation became intolerable. "Marx summarizes the ..... numerous empirical inquiries conducted by the investigating commissions of his day. Women and children were put to work ..... almost all members of the family can work, and wages can be reduced to the level where all must work to survive" (Goode, 1964, 107). The case of Wolverhampton brickyards has already been examined. Finally domestic service and retailing must be considered particularly attractive to female labour (Best, G., 1973, 120-1) and by contrast occupations such as mining may have offered relatively small scope for female employment once the use of women underground was prohibited (1842). Domestic manufacturing, extreme poverty, retailing and domestic service therefore offered the major contexts of female employment in a nineteenth century town like Wolverhampton where textiles were not a significant industry.

Similarly, fertility decline - even amongst the higher social strata - may have occured largely after 1871. Certainly this is the view of Banks (1954, 4). "In general, the decline in family size commenced as

an upper- and middle-class phenomenon at some time in the 1860s and 1870s. It was not until some time later that the new reproductive habits began to spread amongst the less privileged social groups." Banks advances a complex web of argument which need not be repeated here. Broadly, however, it is suggested that in "setting up their own behaviour as a model for the working class to follow (the middle class) made it imperative upon themselves: and it was from this notion of the immorality of imprudent marriages that the later developments of the birth-control movement made their start" (ibid., 31). The model middle class behaviour was based on admiration of Malthusian prudential restraint which demanded a man delay marriage until he could support a wife and family (Harrison, 1973, 147). Between 1855 and 1875 the standard of living achieved by the middle class and the range of satisfactions considered appropriate to a civilized life rose dramatically. Prices increased by only 5%, but the expansion in standards required an additional outlay of 50% if status was to be maintained, and family receipts probably rose by only 20%. "In so far ..... as the great expansion in taxable wealth in the earlier decades has been the main factor in the rise in middle-class standards, the period after 1873 may well be regarded as one of quite serious limitation and hence of reassessment of the cost of raising children" (Banks, 1954, 131). The imperatives of middle class life styles combined with the setback suffered by incomes after 1871, Banks argues, encouraged family limitation. Stevenson (1920) found inter-class differences were far less for the cohort married between 1851 and 1861 than for that married between 1881 and 1891. The fertility of those in class I married 1851-61 was 10% below the other classes, which among themselves had similar (standardized) fertility rates. Could the comparison have been carried 20 years further back, Stevenson claims, a period of substantial equality between all classes might have been revealed.

The case is a strong one, and direct evidence to the contrary is scarce, but limited indications that upper class fertility was a little

below that of the lower classes in York, even in the decade 1841-1851, (Armstrong, 1967, 127) are enough to confirm the value of investigating fertility variables over the period 1851 to 1871. The combined evidence of Banks (1954 and 1964), Armstrong (1967), and Stevenson (1920) admits the possibility of class fertility differentials in Wolverhampton by 1871 - even though the major changes occurred thereafter. It is now useful to summarize the form of the "family-status" type dimension which was expected to emerge from an analysis of data for 1871.

The nuclear family being dominant, life cycle variations in household complexity, population age structure, fertility and female participation rates was expected as a reflection of the extent to which different stages in the life cycle tended to be acted out in different parts of the city. Major life style variations in fertility and in female activity rates were thought unlikely so that the axis expected to emerge in 1871 was a proto-family status dimension lacking the full fertility and feminist employment patterns of a modern family status axis. Fertility is likely to have been closely linked with age and sex composition and female occupation rates with occupation (domestic service and retail dealing being obvious areas for female employment). Household complexity remains a major plank in an interpretation of "family status" in the nineteenth century. Initially complexity was high amongst upper status households but, by 1871, had begun to decline so that household composition increasingly reflected life cycle rather than status differences. The failure of the emerging axis to embrace all the fertility and feminist occupational characteristics of modern times would then be seen as evidence that the process of temporal evolution still had some way to go. It was felt that a complete family status axis was unlikely to have been achieved by 1871 and that fertility and female employment were likely to form the missing items.

Four elements of the possible family status/household complexity configuration had to be represented from available census data: household complexity itself, stage in the life cycle, fertility and female participation. Fertility, for example, could not be omitted on the grounds that life-style variations therein were thought unlikely to have emerged, because the incomplete nature of the proto-family status axis cannot be portrayed without fertility variables. In addition, it was essential to allow for the possibility that any of the four supposed elements of the family status dimension might emerge as closely connected with an alternative differentiating axis.

5.2 Census Data And The Problems Of Measuring Household Complexity

5.21 The Household

The first problem in characterizing household complexity was the definition of the household itself, for the nineteenth century census enumerators were given no precise description of what the term meant. Two related problems arose: (a) that of selecting an acceptable definition of 'household', and (b) that of developing a procedure, based on such a definition, for analysis of the returns. Obviously there was no point in choosing a definition of 'household' which could never be operationalized from the available data.

The interpretative and practical problems of using census returns are considered at length by Armstrong (1966 and 1968a) and by Anderson (1972b), while Tillot (1972) provides additional discussion of sources of inaccuracy. Before examining alternative ways of treating the returns it is important to note that the meaning which the enumerator intended to convey was only very rarely in doubt. But the existence of a few cases (often the work of a minority of enumerators whose work involves many difficulties) where the returns were ambiguous, demanded a standard technique based on precise definitions. One of the most important needs

for the present analysis was for a treatment which was comparable, or very nearly so, over the three censuses 1851, 1861 and 1871, and comparable between different enumerators for a single census.

Anderson (1972b, 136-7) recommends the census family, or the group who co-resided with an 'occupier', as the unit of analysis. He quotes the definition of occupier in the 1851 instructions to enumerators: "either a resident owner or any person who pays rent, whether (as a tenant) for the whole of a house or (as a lodger) for any distinct floor or apartment". This co-residing group, as he calls it, did not commend itself for use in the present analysis because it understated the very marked differences between the various parts of the city. Where individual houses were shared the number of persons in a house might be far larger than in areas where one family per house was the rule; yet adoption of the census family as the unit of analysis hides this fact, for 'co-residing groups' tended to be more similar in size. Additionally the varied treatment of lodgers at different dates and by different enumerators made the co-residing group difficult to define. As Anderson (ibid., 142) admits, "..... in 1861 and thereafter many more schedules were issued to single lodgers and to small families. One even finds occasionally (quite logically in a sense) each lodger in a house being given separate occupier status, with the paradoxical result that there are recorded more 'occupiers of separate apartments' in a house than there were different rooms". Therefore some enumerators grouped single lodgers together and entered them all as lodgers; some did the same but arbitrarily labelled one as head; some allocated each to a separate family and described each as a lodger; a few even allocated each to a separate family and described each one as a 'head'. Some ignored the new instructions of 1861, following the most common 1851 practice of including most lodgers, particularly if they were single, in the same census family as the head.

The house was also difficult to define on occasions, but - unlike the co-residing group - there were fewer differences between censuses, and the greater number of defining characteristics made it easier to allow for the idiocyncracies of particular enumerators. Although addresses were rarely listed in full (numbers being absent, and often ditto marks were used beneath the first entry on the page) a new entry almost invariably coincided with a new schedule number and a figure '1' in the column headed 'houses inhabited', a new household 'head' and (often) the ruling or marking appropriate to the census concerned. Hence the omission of a '1' in the 'houses inhabited' column could be corrected, as Anderson suggests (ibid., 140). This was particularly useful in isolated cases where every lodger was recorded as a household head in his own right and where definition of the co-residing group would therefore have been dubious. The number of different characteristics by which a new house is indicated was found to compensate for any such lapses.

Adoption of the house as the unit of analysis is advocated by Armstrong (1968a), not because it facilitates intercensal comparison, but because he has no confidence in separate schedules, ruling and marking as criteria for defining the census family. This may be unfair to Anderson, who defines the co-residing group as all the names listed from one entry of 'head' to the last name preceding the next entry of 'head' (Anderson, 1972b, 136-7), but he admits the difficulty of differentiating co-residing groups might encourage researchers to use the house as the unit of analysis (ibid., 143). His belief that this is undesirable stems from a desire to derive sociologically meaningful units rather than to select variables which are relevant to the testing of theory and are likely to behave consistently in successive censuses.

The approach adopted here therefore resembles that of Armstrong (1968a) who treats all persons on the second and third schedules within a household

as lodgers of the family on the first. He regards a household as sharing when there is at least one identifiable family unit (a married couple, or an adult with at least one child of his/her own) amongst the lodgers, whether or not they were listed on a separate schedule.

The household was defined to include all persons apparently living in the same house (cf. 'houseful' as used by Anderson, 1972, 136). Broadly, the procedure adopted in interpreting the returns was that provided by Anderson (ibid.) for identifying a new house, but with more emphasis upon agreement between all available criteria. It was therefore rarely necessary to invoke the primacy of any one criterion (the 'long line' in 1851, or a '1' under 'houses inhabited' for 1861 as Anderson advocates) to decide doubtful cases. Generally, the ruling or marking, a new address, the entry of a new 'head', the use of a new schedule, and the new figure '1' under 'houses inhabited' coincided, confirming that the inhabitants of a different house were being enumerated. If this was not the case, agreement of four of the five criteria was accepted (hence agreement of the other four suggests the absence of a new figure '1' under 'houses inhabited'). Otherwise the new figure '1' was taken as decisive so long as the number of these '1's tallied with the total at the foot of the page. This latter provision was necessitated by the tendency of two enumerators to record a '1' in the column 'houses inhabited' at the top of every page - even where the first entry upon a page was the two-year old son of the last entered person on the preceding page! In such cases, however, it was found that the number of houses at the foot of the page excluded this continuation. The use of a new figure '1' as the deciding criterion was dictated by the need for a consistent treatment of all three censuses, and though Anderson advocates the 'long line' ruling for 1851 few problems arose as a result of this alternative technique. So long as the page total tallied with the number of '1's there, the prime criterion never contradicted the burden of evidence: even in the most marginal cases the '1' coincided with two of the other four criteria.

5.22 Household Composition

Before selection of indicants of household complexity was possible it was necessary to devise some classification of the members of a household. Drawing heavily on the work of Cullingworth (1960) the head's nuclear family was said to include the head's spouse and all designated children. The latter included all children of the head or head's spouse, regardless of age, except those married, and those widowed or divorced who were accompanied by children of their own. Orphans apparently cared for by the head and head's spouse were also included. These designated children are referred to as heads' children, and it is this group whose employment characteristics were considered in the previous Chapter. The major advantage of the heads' children for analytical purposes is the ease with which an exactly comparable group may be derived for each area of the city: alternative definitions invariably embrace children lodging with the household head and working for their subsistence, and apprentices - thereby making child employment differentials a partial function of household complexity too.

Outside the head's nuclear family a household might contain relatives and non-kin. Relatives were defined as those individuals related to the head or head's spouse. Relatives and the head's nuclear family were collectively referred to as kin. Non-kin included all other members of the household - servants, lodgers, visitors, employees and the like who were related neither to the head nor the head's spouse.

It seemed desirable to subdivide non-kin into servants and employees on the one hand, and lodgers, borders and visitors on the other. The distinction was intended to mirror that between household complexity due to high status and complexity resulting from lodging and multiple occupancy. But visitors proved fairly common in high status households and it was difficult to decide whether the term 'visitor' was a middle class euphemism

for 'lodger' or whether high status households (particularly near the city centre) genuinely did more entertaining. Employees also posed problems for there was some suggestion that a few employees were listed as lodgers of the household head because they both lived and worked with him. More serious still, the presence of employees had been used to determine social class: heads otherwise allocated to class III were placed in class II if there were employees in the household or where the number of employees was stated. Use of employees to calculate household complexity too seemed unwise for a necessary link between high status and complexity might have arisen.

Detailed examination of the census returns offered an alternative. In areas where lodging predominated, the pattern was one of multiple occupancy with more than one family sharing the same house; this was particularly true of Irish areas where lodging was heavily concentrated. By contrast, areas of high status and great household complexity rarely had more than one family in the same house. Again there were many non-kin but few lived in families. Loners were therefore defined as those members of non-kin who had no relatives living in the same household with them. In high status areas a very high proportion of the total population appeared to be loners. In low status lodging areas there were still many loners, but families of lodgers ensured that loners only formed a relatively small proportion of the total population.

5.23 Variable Selection

Once the household had been defined, the mean number of persons therein was an obvious simple index of composition and complexity. By definition a one-person household contained only the head, and the greater complexity of households containing servants, employees, lodgers and visitors was reflected in their greater size. But size alone was inadequate: a Household of three persons might include either the wife and child of the head or two lodgers unrelated to the head.

Two further measures of complexity were adopted. The percentage of households containing non-kin was chosen to reflect the extent to which head and kin did not form the sole components of household structure within an area. It was deliberately framed to include both complexity derived from status (servants and employees) and complexity due to poverty (taking in lodgers etc.). Finally, the percentage of the population that were loners was intended to distinguish between these two types of complexity, with high status being initially associated with high proportions of loners.

5.3 Census Data And The Problems Of Reflecting Family Status

5.31 Female Participation

"Working wives" appeared to offer a good index of female participation, with the possibility that poverty was the decisive factor and the alternative that value orientations, tradition, the importance of domestic industry and other determinants were more important. It was, however, necessary to restrict attention to wives of male household heads to ensure comparability across the city. Deserted wives, obliged to work to support their children, widows and divorcees incorrectly listed as married, and similar cases might have concentrated in some areas. The "percentage of the labour force that is female" was also selected, for concentration on the wives of heads was felt to be too restrictive in ignoring the never married, the widow and the unmarried girl. The two variables were felt to relate together in a useful way, for whereas working wives may have been common in poor areas of the city, a high proportion of females in the labour force may have arisen in high status areas because of the importance of domestic service.

Finally, the "percentage of households with female heads" was also chosen as an indicant of female participation. Certainly this embraced a life cycle variation, with widowhood as a major cause of female headship

and little evidence of female independence before marriage. Single women who worked and lived alone were rare, but female heads who took in lodgers were more common. Life cycle and compositional variations may therefore be combined.

Together the three variables seemed to present a fairly accurate picture of Victorian society, with female participation largely a function of social status, particular occupations (such as domestic service) and the final stage in the life cycle. If, however, new value orientations arose in the period under examination - causing many girls to eschew marriage and pursue careers of their own or leading many wives to forsake familist goals for jobs and higher living standards - such changes would clearly be reflected by the variables selected and by their relations with other indicants.

5.32 Fertility

The "fertility ratio" adopted by Shevky and Bell (1955) is probably the best known census-based measure of fertility, but since the census is a static picture and not a sequential description of events, the reliability of any attempt to derive rates has often been questioned. As used here the fertility ratio is that between the number of children under five years old, and the number of females aged fifteen to forty four. But the fertility ratio may be artificially lowered by the presence - perhaps as domestic servants - of many single, childless women aged between fifteen and forty four. Ideally, single women should be excluded from the totals, but several were found to have children and their exclusion seemed inappropriate. When returns were discovered in which 'condition' had been incorrectly stated (sex, or relation to the household head being recorded instead) all attempt to exclude single women was abandoned, and "fertility ratio" was based on all women aged 15-44.

This variable was supplemented by the "percentage of heads with children", to reflect the proportion of households where a life style

including the raising of children was the norm. The "mean number of children per household" was also considered, but was too closely linked with the age of household heads in particular areas for use as an indicant of fertility and an associated life style. Neither variable captured the essence of high fertility life styles. What was required was a measure of the interval between successive children. The census unfortunately lists only the de facto population so that there is no way of being certain that an intervening child is not absent. Nevertheless, the 'interval'-type fertility measure was felt to represent the familist orientation well, and since it offered a means of detecting class-based fertility differentials strenuous efforts were made to implement it.

Two alternative approaches were tried. Firstly, it was felt that absence of a child was least likely while the child was very young, so that the interval between the two youngest children present at the census was the most reliable guide to reproductive behaviour. The pilot study demonstrated that the accuracy with which ages were reported (Tillot, 1972, 107-8) was a serious handicap of this procedure. Once a child had passed the age of twelve months, his age was generally reported only in whole years. A thirteen month old child and a sibling aged thirty-five months would be reported as one and two years old respectively giving an apparent interval of twelve rather than twenty-two months. The second alternative was based upon the mean interval between all children present and was obviously subject to distortion whenever even one child was absent on census night. The first correction attempted set an arbitrary maximum value for the mean interval of any family; exclusion of children more than seven years older than the next youngest sibling was tried too. None of the methods adopted proved particularly successful, though the mean interval procedure was felt superior to that between the two youngest children. The accuracy with which ages were reported mattered rather

less, and the tendency of newly married couples to have two children in relatively rapid succession followed by others at a rather slower rate could be taken into account.

Finally, the mean interval between all children present was used to dichotomize the population of heads with two or more children. High fertility was considered to exist if the mean interval between the children present was two years or less; hence a family of five children must all fall within eight years of age of each other for this condition to apply (there being four 'intervals' between five children). For families with more than five children the mean was raised to 2.5, and for families with nine or more children to 3.0 so that nine children with ages all within twenty years of each other were not discarded as low fertility. This technique amounts to defining a criterion of "high fertility" such that a group might be selected who were characterized by higher rates of reproduction than the population at large. The size of this group was then expressed as a percentage of the total number of households containing children of the head.

The "high fertility" variable had many undesirable characteristics: absence of children and mortality were ignored, and excessive weight was given to families with only two children. Even so, it was thought that a subgroup of the population had been isolated which was particularly likely to have strong familist goals. Examination of the results show that the variable did not behave predictably and it cannot be judged a great success. The "high fertility" variable is retained for illustrative purposes but the main burden of the discussion relies upon the remaining two measures of fertility.

5.33 Life Cycle Stage

The final element of the family status axis proved easy to operationalize for the age of each individual was listed in the returns. Use of

an Age Strcuture Index (Coulson, 1968) was investigated but it proved unnecessarily elaborate and did not focus on age groups of particular interest. Two variables were finally selected. The "mean age of household heads" was adopted to reflect the youthfulness of heads in newly built areas, if such a pattern existed, and to suggest the age of heads in areas where young families were moving out. Where a large population was accommodated as lodgers, relatives of the head, etc. such a variable might have been misleading, and was therefore supplemented with the "percentage of the total population aged 65 and over".

Alternative measures of life cycle stage based on the age of the head and the number and age of children were rejected since they referred directly to household composition. Had such an indicant been selected, each head would have been allocated to a particular life cycle stage ranging from pre-familist (e.g. a married couple aged 20 with no children) to post-familist (the same couple forty years later when all children have left home) and there would inevitably have been a high degree of correlation between the proportion of heads allocated to the various familist life cycle stages and the fertility measures already outlined. Variables were selected to minimize such definitional inter-relationships. The proportion of the total population over 65 was small so that relatively large proportions of elderly people in an area need not imply a very low proportion of children. Similarly, the mean age of household heads varied within a relatively narrow range and even if this restricted the age composition of the head's own family, there was still the possibility of many (or few) children within the non-kin group.

5.4 An Evaluation Of The Variables Selected

Eight variables were adopted to reflect various aspects of the family status axis, with a further three being devoted to household complexity.

The eleven variables are listed below

06 Percentage of labour force, female.
07 Percentage of households with female heads
08 Percentage of heads' wives working.
09 Percentage of households with children, with a high fertility pattern.
10 Fertility ratio (children 0-4/females 15-44).
11 Percentage of heads with children.
12 Percentage of sample population aged 65+.
13 Mean age of household heads.

21 Mean number of persons per household.
22 Percentage of households containing non-kin.
23 Percentage of sample population, loners.

The first feature to emerge from an examination of these variables is their variety. Female participation, fertility, life cycle and complexity elements are all covered. Further, despite the problems with variable 09, there was relatively little doubt about what was being measured. Whereas the validity of social class measures was subject to considerable debate, female participation and life cycle variables posed very few problems. Life cycle measures may appear to lack an obvious index of the importance of the young population, but this is present in the fertility variables. Fertility did, in this respect, constitute more of a problem: using census data it is easy to count children, but difficult to isolate high reproductive rates. The poor performance of the high fertility criterion emphasizes the problem, but similar difficulties affect modern factorial ecologies and the use of the fertility ratio seems reasonable.

With regard to household complexity matters were more complicated. Two very simple measures reflect the size differences in households throughout the city and the varying proportions that contain non-kin. Both are relatively straightforward. Only in variable 23 (loners) is there any substantial room for debate. Whilst the solution adopted here is defended it seems that the most likely area for progress would lie in the development of a full range of status indices which <u>in no way</u> rely upon facets of household composition such as the presence of employees and (indirectly) of servants. Household complexity measures could then be based directly

upon the presence or absence of such individuals and the decline in the complexity of upper status households would be revealed in full measure. It must be conceded that areas containing many servants also included many loners, for most servants were loners. Though the variables chosen are not therefore ideal, the importance of loners within the total population appeared to offer an acceptable index of the greater complexity of households in certain areas.

It is in reflecting the family status dimension that the range of possibilities is greatest and some arbitrariness must be admitted in defining the final variable list. In addition, since the variables had to be chosen before any substantial experience of their limitations was available, certain variables might have been more usefully presented in a different form. The most serious problems concerned variable 09 and it is now recognized that an interval measure of fertility is difficult to use in practice. Nevertheless it is maintained that, as a package, the eleven variables listed above adequately reflect the underlying theoretical dimensions of family status and household complexity.

CHAPTER 6 INDICANTS OF ETHNICITY AND MIGRATION STATUS

6.1 The Nineteenth Century Background

Much has been written about the patterns and processes of migration in nineteenth century England, and a number of common themes emerge from this literature which are relevant to the urban scene. First, a link between migration and poverty is generally acknowledged (Redford, 1964). The Settlement Acts were designed to prevent labourers from migrating to (and gaining settlement in) another parish where they might become eligible for poor relief, but by the 1840s effective restrictions on migration had collapsed (Harrison, 1973, 175). In Wolverhampton paupers removed to their parish of birth often returned and had to be removed again (Committee on Poor Removal, 1854, Appendix 15, 64 and 71), and many large manufacturing towns contained a substantial migrant element. Giving evidence about Wolverhampton to the Royal Commission on Trade Unions (1867), Mr. R. Kettle - district judge and a Wolverhampton resident - stated that "..... bricklayers' labourers are not generally part of the permanent population ....." (ibid., 46 question 7045) and, in Wolverhampton, were largely Irish and some English migrant workers.

A second theme is the dominance of short-distance migration (Redford, 1964). Harrison (1973, 27) summarizes the common view.

> "Employment opportunities ..... were better in urban than in agricultural areas, thanks to ..... industrialism and the factory system. Consequently there was a movement to the towns from the villages and farm lands, which declined (at first relatively, but later absolutely) in population. The townward drift took the form of short distance movement in the first instance: migrants into the industrial towns of Lancashire and Yorkshire came from the surrounding rural counties. Small towns sometimes served as concentration points for later movement to bigger towns; so that the pattern of ..... migration resembled a series of concentric circles, with the large town in the centre. Movement to towns was particularly marked in the 1840s ....."

The generality of this pattern is well established. Armstrong (1967, 81) shows that in 1841 89.19% of the population of York had been born in Yorkshire,

only 8.61% in the rest of England and Wales and Scotland, and 1.49% in Ireland. By 1851 the total population had risen by over 25% and these figures 82.71%, 11.79% and 5.31%. Though the number of Irish had increased very dramatically in relative terms (+349.4%) the largest augmentation by immigration over the decade, in absolute terms, was from the surrounding county - especially its rural parts (ibid., 83).

Thirdly, there is broad agreement about the lowly social position of Irish immigrants. Engels (1844, reprinted 1974, 123-4) describes how the Irish displaced the English poor in the worst slums.

> "The worst dwellings are good enough for them ..... (The Irishman) builds a pigsty against the house wall as he did at home, and if he is prevented from doing this, he lets the pig sleep in the room with himself ..... At home ..... there was only one room for all domestic purposes; more than one room his family does not need in England. So the custom of crowding many persons into a single room, now universal, has been chiefly implanted by the Irish ....."

Many features of this description apply to Wolverhampton. Pigkeeping was common (Dehane, 1840, 221 and 223) and overcrowding was a serious problem. Mr. J. Hill's answers given in the Second Report of the Commissioners on the State of Large Towns (1845, 30-1 of appendices) try to minimize the issue: "Lately, more than one family is crowded into one house; the average has been 5½ in each bouse ... but ... must now be about 6½". Evidence given before the Select Committee on Poor Rates Assessment by Mr. J. Phillips (1868, question 1096) reveals "many cases in which two families live in a house" even at the end of the study period. More specifically related to the area of Irish concentration was the statement of Dr. Gates (Dehane, 1840, 223) that, "In one house in Caribbee Island I had no less than 8 cases of typhus fever at the same time ..... fever assuming so severe a character in this locality (because of) the crowded state in which they live, several families residing in the same house; there is also great want of cleanliness in their persons, together with extreme poverty ....." A similar association between the Irish and

low socio-economic status is confirmed in nineteenth century Liverpool (Pooley, 1974, 3), York (Armstrong, 1967, 86-7) and elsewhere (for London by Lees, 1969; for Preston by Spenser, 1967-8). But the Irish were only one very disadvantaged section of a working class population which occupied older areas in British cities. Segregation was, Pooley (1974, 4) argues, "..... in the first instance by socio-economic status, due to the operation of market forces in housing supply, and ..... within these low status zones ..... a secondary segregation by ethnicity took place".

Ideally, a fourth theme would relate to the social status of non-Irish migrants, but evidence is scanty. Armstrong (1967, 86-7) shows that immigrants in York varied in status according to origin; those from the agricultural East and North Ridings had a larger proportion in classes IV and V than migrants from the West Riding, the Northern Counties, the rest of England, and those born in York. By contrast, longer distance migrants from the Northern Counties and the rest of England were better represented in classes I and II than those from the North and East Ridings. Pooley (1974, 4) suggests that Welsh immigrants in Liverpool were largely skilled artisans of moderate status whilst Scots were either merchants or "decent working-class". Direct comparison of such findings with others (Ward, 1968 and 1969; Weber, 1899 etc.) is difficult but two generalizations based on modern studies appear to be of some value. Firstly, it is often suggested the younger, better educated and better qualified tend to be more mobile, and long distance migrants may be of rather higher status than the population at large. Secondly, rural migrants are normally held to be of lower status than those from urban centres.

Finally, a fifth theme concerns the social character of immigrant communities. The migration experience of immigrants obviously differs considerably from that of the rest of the population - so much so that

McElrath (1968) regards migration status as an independent social dimension apart from ethnicity. Areas of recent and heavy migration are also often characterized by disproportionately male sex structures, with immigrant males concentrated in the 20-45 age group and frequently unmarried. Male employment rates are often very high and low status occupations predominate.

In framing the variables to reflect ethnicity and migration status, therefore, it was felt desirable to recognize the Irish, those of rural origin and those who had moved relatively short distances (as being potentially of lower status) and also long distance migrants and those of urban origin (as being potentially of higher status). Further, it was thought desirable to reflect differences in migration experience, the overcrowding of ethnic ghetto areas, and the predominance of males (particularly employed males) in such migrant zones.

6.2 Census Data And Variable Selection

The main limitation of the census returns with regard to ethnicity and migration status is the presence of only one item of information of direct relevance - the birthplace of each individual. A partial remedy lay in the recognition of key characteristics of immigrant areas, allowing a wider data base than the single birthplace variable. Nevertheless, the absence of information about the addresses of individuals one or five years prior to the census made precise quantification of migration experience difficult. Of the numerous experiments with data manipulation, three merit further discussion: classification of birthplaces, attempts to reflect migration experience, and analysis of key characteristics of immigrant areas.

6.21 Classification of Individual Birthplace Data

The normal treatment of birthplace according to regional location (see Armstrong, 1967, 83 for a similar approach based on York) was used

in an experimental classification of the birthplaces of household heads only. It was intended to extend analysis to all household members once an acceptable classification had been devised. This first approach subdivided England and Wales into ten areas: Staffordshire, the rest of the West Midlands (Worcestershire, Warwickshire, Shropshire and Herefordshire), and eight major regions shown in Figure 6.1. In addition, birthplaces in Ireland, Scotland and Other Foreign Countries were distinguished, and all other entries (blank, not known, at sea etc.) were grouped together as "Others". It soon became clear that the number of individuals from each of the eight regions was far too small for their use to be contemplated on sample small area data and they were aggregated as "non-local English and Welsh". Similarly, the number of individuals born in Scotland proved extremely small, as contemporary evidence confirms (Poor Law Commissioners, 1834, Appendix B2, 213i, question 42). Foreign born heads, those born at sea, and those whose birthplace was unknown or unrecorded were very rare too. It was hence decided to group them all in the same category as the Irish: though this may appear to contradict the ethnic basis of the classification, the resulting class was - for practical purposes - treated as Irish. Certainly they were born outside England and Wales and therefore may be regarded as "immigrants": only a minute number were placed in this category because their birthplaces were unknown.

The resulting classification contained only four categories (Staffordshire, Other West Midland, Non-Local English and Welsh, and Others - mainly Irish) but proved remarkably effective. Examination of the whole population in a small number of EDs suggested that relatively little was to be gained from an extension of the classification beyond household heads: birthplaces of household heads provided a very useful summary of the probably migration experience of adult members of the population in an area. In only one respect did the data seem inadequate:

Figure 6·1: Classification of Birthplaces

those born in Wolverhampton had not been isolated from the group born in Staffordshire. The local 'Black Country' area was an important source of population, whereas Staffordshire included the Potteries and large rural areas too. Recognition of Wolverhampton as a separate category tended to obscure the Black Country contribution - as did the Warwickshire and Worcestershire boundaries - but at least provided clear evidence of the importance of those native to the town. Comparison of 1851 and 1871 suggested that, in immigrant areas, much was to be gained from calculating the proportion born in Wolverhampton on the total population rather than merely on household heads. By 1871 the number of Wolverhampton-born children of Irish household heads was considerable. These data were collected in the second "run" through the returns, and Wolverhampton-born household heads were distinguished too.

But the use of this simple regionalization failed to meet the need, outlined above, for a distinction between urban and rural migrants, and between short- and long-distance moves. The second "run" was therefore also used to reclassify household heads. Rural migrants could not be identified rapidly, for the parishes from which they came tended to be small and unfamiliar; by contrast, urban migrants came from large areas with familiar names. The table of "principal towns and places with populations exceeding 25,000", published with the 1841 census, allowed a set of heads born in the largest towns to be identified. To distinguish long and short distance moves the second "run" was further used to identify all heads born more than 100 km from Wolverhampton.

The second "run" was accomplished for the 1851 returns and the value of the data collected was assessed. The list of "principal towns and places with populations exceeding 25,000" included Wolverhampton. In classifying migrants, all those from Wolverhampton had to be excluded. Unfortunately the number born in the remaining large towns was very

small and of little use in the sample analysis of small subareas of a city. Use of this type of measure was therefore abandoned. Examination of the data regarding heads born more than 100 km from Wolverhampton proved equally disappointing, for at an aggregate level they were very similar to those classed "Non-Local English and Welsh". Figure 6.1 shows the basis of the problem. Staffordshire, Worcestershire, Warwickshire, Shropshire and Herefordshire lie wholly within 100 km of the town and most migrants came from these counties. Broadly, therefore, there was little difference between a non-local English or Welsh regional origin and birth outside a 100 km radius. Yet migrants born in counties which, like Oxfordshire, Gloucestershire and Nottinghamshire, straddle the 100 km circle, had proved very laborious to classify. It was clear that time spent locating obscure rural parishes in Radnor or Rutland could have been better spent, and classification by distance was discontinued.

Ultimately, therefore, the treatment of birthplace data relied solely upon regionalization. Each of the variables for which data had been collected was plotted against the others and the results were inspected. Variations in the proportions born in Staffordshire and in the Other West Midland counties did not seem particularly significant when compared with those in the remaining birthplace variables. Additionally, five birthplace variables were felt to be too many. The variables selected were therefore "the percentage of the sample population born in Wolverhampton", "the percentage of heads, non-local English or Welsh" and "the percentage of heads, Irish, Scottish or Other". A clear ethnicity indicant was felt to reside in the last of these, while the category of non-local English or Welsh seemed very likely to form a group of higher status long distance migrants. As Armstrong's analysis (1967, 86-7) shows, this type of regional framework is quite capable of reflecting important socio-economic differences.

6.22 Classification of Household Birthplace Data to Reflect Migration Experience

Birthplace is an unsatisfactory index of mobility, and since birth date is ignored its relevance to recent experience varies from individual to individual. McElrath (1968) suggests that migration status forms an independent social dimension in its own right and is not merely an aspect of ethnicity. This seems most likely to be true in circumstances where many migrants were not culturally or ethnically dissimilar to the host population, and this situation may have existed in nineteenth century Wolverhampton. Ideal data might be the place of residence of each individual one, or five years previously but no such information was available. Using census birthplace data certain conclusions could be drawn regarding the migration history of family groups which include children. Clearly, if the household head, his wife and their eldest child were all born in Ealing while all subsequent children were born in Wolverhampton it is most likely that the family group moved to Wolverhampton between the birth of the first and second children. Hence the family may be classed as movers and the date of that move fixed to within a few years. Where the head and his wife were both born in Wolverhampton and all their children were born there too, the family may be classed as non-movers. The technique had many failings. Much of the population fell outside the type of family group necessary to permit classification. Areas characterized by mobile loners were represented by family groups which were therefore atypical. Great efforts were applied to minimize distortions in Wolverhampton. At all three censuses, non-mover family groups formed a higher proportion of all classifiable family groups in inner areas than in outer parts of the city, but the sample size and variations in coverage made any application at ED level impossible. It was, however, clear that the proportion of migrant family groups identifiable as having moved into Wolverhampton within the previous ten years was far greater

in 1851 than in 1871. Though the procedure was abandoned this information was very useful.

6.23 Identification of Migrant Characteristics Independent of Birthplace Data

A more fruitful approach was to operationalize important migrant characteristics. Migrants tend to fall within the 20-45 age group and Lawton (1955) attributes such a bulge in Liverpool's 1851 age structure to immigration. Migrants also tend to be male, single and occupied too. Areas which have received heavy streams of migration should thus be identifiable by several characteristics. Though age structure was attractive as an indicant, it was felt to be too closely related to variables already selected to reflect family status life cycle elements, and was therefore rejected. Marital status was seriously considered but appeared to be very closely related to the number of servants (who were dominantly single) in some areas. Finally, therefore, "sex ratio" (males per 100 females) and "percentage of males gainfully occupied" were chosen as indicants of key migrant characteristics.

It might be argued that the two variables selected are not indicants of ethnicity and migrant status and, in fact, no such claim is made here. Both may be used to isolate important characteristics of areas which have received new immigrants fairly recently and hence constitute ancilliary measures in much the same way that servants and child employment were used to suggest social status. But both may also turn out to have been linked with differentiating dimensions other than ethnicity: the sex ratio might vary with social status as a result of the numbers of female servants in better-off areas, or with family status as a reflection of life cycle variations in the proportion of women in the population. Alternatively it may be most closely related to an occupational axis since female employment after the 1842 Act would presumably be more limited in mining than in retailing and dealing areas. The fact that these and

other of the selected indicants may have been related to a number of theoretical dimensions is important when hypotheses regarding the evolution of factor structures are under consideration - it being more difficult to demonstrate the gradual dissociation of two axes if variable selection imposes an artificial independence throughout.

Immigrant areas in nineteenth century British cities seem also to have been characterized by overcrowding and by patterns of multiple occupancy. Again, therefore, it was desirable to derive ancilliary measures of ethnicity and migration status for these might be related to family status (via household complexity) or to socio-economic status (since multiple occupancy and lodging were largely lower class phenomena). Density proved difficult to measure because data regarding the number of rooms in each house were lacking. Finally, calculation was based on "the sample population per occupied 200 metre grid square" - unoccupied squares being excluded to avoid artificially low values due to the inclusion of large areas of farmland. Treatment of multiple occupancy proved relatively simple within the framework already developed for household complexity. It will be recalled that a household was defined as all persons living within a single house, and that non-kin referred to those members of the household outside the head's nuclear family and other relatives. Again following Cullingworth (1960) the concept of family nuclei within the household was introduced. The head's nuclear family could not, by definition, include a separate family nucleus, for all married children of the head or head's spouse were excluded therefrom, as were widowed and divorced children of the head or head's spouse who had children of their own. Hence a family nucleus could only occur amongst the head's relatives and/or the non-kin. Within these groups a family nucleus was considered to exist whenever husband/wife or parent/child relationships were found. Two (or more) family nuclei were recognized within a

household only when no individual was common to the qualifying relationships: hence a husband, wife and their child constituted only one family nucleus. Both partners to a marriage relationship had to be present before a family nucleus was admitted: it was insufficient for an individual to be recorded as "married". The couple might have been separated and the occupancy pattern would not be one of two family units in the same house. When the number of family nuclei settled it was standardized for each areal unit by reference to 100 households. When 37 family nuclei were encountered in a sample ED of 50 households, multiple occupancy was represented as $37 \times 100/50 = 74$.

6.3 An Evaluation Of The Variables Selected

In all, seven variables were chosen either as direct measures or as ancilliary indicants of ethnicity and migrant status. These were as follows.

14 Percentage of the sample population born in Wolverhampton.
15 Percentage of heads, non-local English or Welsh.
16 Percentage of heads, Irish, Scottish etc.
17 Sample population per occupied 200 metre grid square (Density).
18 Number of family nuclei per 100 households.
19 Sex ratio (males/100 females).
20 Percentage of males gainfully occupied.

Of these, three may be regarded as directly measuring ethnicity and migrant status (variables 14-16) and though a true measure of migration experience is lacking the essential element of an ethnicity/migration status axis is clearly represented. Variables 17-20 are ancilliary measures of key characteristics normally associated with immigrant areas. Their position with respect to the direct measures resembles the relationship of variables 03-04 to the direct class-based measures of social status (variables 01 and 02). It is argued here that adequate testing of hypotheses which suggest temporal evolution of factor structures must rely upon variables ~~hwere~~ whose conceptual position bridges the artificial gap between direct indicants of the theoretical axes. It is an important

merit of the census returns that they furnish suitable data so readily. Whilst no reliance could be placed on indirect or ancilliary measures alone, the availability of supplementary data of this kind alongside direct measures is an important feature of the census returns and one which indicates their suitability for temporal comparison of factorial ecologies. While other measures of ethnicity and migration status might have been selected from the Enumerators' Returns, it is clear that the variables listed above are sufficient for the purposes at hand in that they adequately represent the theoretical dimension described in Chapter 2.

CHAPTER 7 THE METHOD

Once the variables had been chosen it was necessary to decide exactly how the returns should be used to furnish the required data. Then the appropriateness of various sets of areal units had to be considered. Finally some choice was necessary between alternative analytical procedures. Certain of these issues had to be settled prior to analysis, while others could await comparison of the results of different approaches. It was not feasible, for example, to draw several different data sets from the enumerators' returns so that the "cost-effectiveness" of different approaches might be assessed, but it was easy to compare conclusions based on several factoring and rotational procedures. In describing the method adopted, the present chapter strikes a balance between decisions made before analysis could begin and decisions deferred until different results could be compared.

7.1 Deriving The Raw Data

In 1851 Wolverhampton township contained nearly 50,000 people; by 1871 this had risen to nearly 70,000. Before any analysis was undertaken, therefore, it was clear that the number of households present at each census was of the order of ten to fifteen thousand. Sampling was unavoidable; complete coverage would not be manageable by a single researcher if more than one census was to be examined. Initially it was intended to analyze all four censuses 1841 to 1871 and a pilot "time trial" indicated that a sample of about 2500 households per census was the most that could be contemplated on this basis. Experiments also proved that systematic sampling was the only feasible approach; attempts to operationalize a random sampling procedure floundered on the impossibility of marking returns stored on microfilm, and the absence of sequential numbering which could conveniently be used for identification purposes.

With no way of marking the returns it was necessary to copy out sufficient information to identify each household (and later each sampled household). Schedule numbers were useless for this purpose owing to their frequent alteration and re-alteration by enumerators and because they were sometimes absent on the microfilm copy because of the tightness of binding of Enumerators' Books.

Systematic sampling of every nth unit appears to be the most commonly used procedure for this purpose (see for example Armstrong, 1967 and 1968a), yet the technique poses serious problems. Floud and Schofield (1968) provide the most articulate criticism of Armstrong's method and their comments are relevant here since they affected the approach ultimately adopted. Most of the difficulties stem from Armstrong's desire to exclude "quasi-institutional" households such as schools, gentlemen's clubs and Irish boarding houses with vast numbers of inmates, on the grounds that these are special cases and demand separate analysis. Similarly, in the present research it was thought desirable to exclude the Workhouse and hospital populations, convents, schools, police station barracks and the like because, as institutional units, they were outside the frame of reference of the theory under examination. Likewise, those living in canal barges cannot be thought of as occupying a definite place in the urban social and spatial structure. As Armstrong (1968b, 609-13) points out, the modern census omits institutions in household calculations in order to focus upon <u>private</u> households.

It is the precise way in which such units are omitted which constitutes the major fault of Armstrong's work, for in taking a 10% systematic sample he selects the 10th, 20th, 30th ..... etc. households; should the 20th prove to be "quasi-institutional" it is replaced by the 21st. The result is not a 10% systematic sample of a known population but a biased systematic sample of an unknown proportion of an unknown population. Floud and Schofield

explain (1968) that in a total population of 20 households, Armstrong's technique selects numbers 10 and 20 whether they are all "normal" households (2 out of 20 = 10%) or when only numbers 10 and 20 are "normal", all the rest being quasi-institutional (2 out of a "normal" population of 2 = 100%). Bias arises because "normal" households falling immediately after quasi-institutional ones have their own chance of selection as part of the population and an additional chance if the preceding household is selected. This might overstate the number of schoolmasters living next to school, and because the proportion of "quasi-institutional" households varies across the city, areas in which they are common will be over-represented in the overall sample.

The central objection to Armstrong's method is its failure to take account of intervening households which are quasi-institutional. If, in locating the 10th, 20th, 30th ..... etc. households, all quasi-institutional units had been excluded from count no problem would have arisen. Each household would have had only one chance of selection by virtue of its position in a list containing only "normal" households; areas containing many quasi-institutional types would not have been over-represented since the sample size would have been independent of the number of quasi-institutional units.

The procedure adopted was therefore a systematic sampling of "normal" households. Contrary to Armstrong's approach, lodging houses were not omitted: only genuine institutions serving non-residential purposes (schools, hospitals, the workhouse, convents etc.) were excluded. One exception was the case of three canal barges incorrectly enumerated on the household schedule: these were omitted because they occupied no fixed position in the urban spatial structure and anyway their locations were in doubt. Other canal barges and the workhouse were enumerated separately so that exclusion posed no problem. In other cases where,

for example, the police barracks occurred in the middle of an ordinary ED it was not included in any way: in selecting every 'n'th household it could not form one of the n-1 intervening houses but was omitted from count. Such a technique avoids most of the criticisms levelled at Armstrong, but it is conceded that convents, schools and barracks are part of the residential structure and ideally should not be ignored.

The sample fraction selected was 20% - or every fifth "normal" household - yielding 1898 households (10,230 individuals) in 1851, 2407 households (12,414 individuals) in 1861 and 2698 households (13,662 individuals) in 1871. The one-fifth sample was in fact the largest which could be handled in reasonable time. Calculation of likely sampling errors showed that though small at the city-wide level they might still be relatively large for individual EDs. This might not seem to matter too much because factor or components analysis applies to a correlation matrix in which sampling error would be random noise. But it was also necessary to calculate factor or component score coefficients for individual areal units, and for this purpose sampling errors might prove troublesome - especially since bias might run consistently through the variable list for a particular ED as a result of dependence upon a single sample of households. If, as a result of random sampling error, the sample data for a particular ED overstated the number of households with children all other related characteristics (age structure, female employment levels etc.) might be misrepresented too: clearly this might influence the factor score of such an ED on a family status-type axis. This possibility added further weight to the case for investigating the spatial pattern and factor structure at higher levels of aggregation that the ED.

Validation of the sample was based upon the totals provided at the end of each Enumeration District and upon the age structure of a selected group of EDs. The enumerators' total numbers of males and females were

adjusted for non-private households (a police barracks was all male, a convent all female, etc.) which had been excluded and then compared with estimates derived from the 20% sample. It was comforting to find that sample values lay well within the 5% range of the true value and therefore, even at ED level, the sample was highly satisfactory. Such conclusions apply only to estimates based on the individual; those based on households obviously relied on far smaller samples. In order to assess the merits of the sample in this respect ten EDs were selected for each census and the age distribution of household heads was calculated in ten year age groups both for the 20% sample of household heads and for all heads. Chi-squared tests were used to examine the hypothesis that the frequency distribution of the sample did not differ significantly, at the 95% level of confidence, from that of the total population (i.e. all household heads in the ED concerned). Unfortunately this hypothesis had to be rejected for eleven of the thirty EDs examined (ten from each of the censuses 1851-1871). The 90% level of confidence allowed acceptance of the hypothesis in all but one case - that of an ED of 1851 with a very small total population.

The implications of these results are clear. At ED level the sample is less reliable <u>for household based variables</u> than is desirable. Grid Units, containing more than twice the population of EDs, and Wards containing ten times the ED population proved far more viable in this respect: a confidence level of at least 95% being achieved in all of the analyses undertaken. (It will be clear from the following section that testing of Grid Unit samples is particularly difficult, and simulated testing based on pairs of EDs was the best that could be attempted on a large scale.)

7.2 Scale And The Question Of Areal Units

Nowhere in the theoretical discussion of residential segregation is there any indication of the scale at which differentiation might be expected to occur, though Shevky and Bell (1955, 20) claim a constant pattern from intra-city to inter-national levels of analysis. Form et al. (1954) show there is little correspondence between urban sub-areas delimited on different criteria - a conclusion confirmed by Mabry (1958) and by Myers (1954) who stresses the variation in homogeneity between different areal units. For this reason, and because of doubts regarding the sample size at ED level, it seemed advisable to investigate several levels of aggregation. Another problem was posed by boundary changes which hampered simple aggregation and reduced the comparability of data for different census dates. Constant boundaries were felt to be essential for valid temporal comparison. Wards were consistent (with one minor exception) over the whole period 1851-1871 so that the various EDs could be aggregated to fixed ward boundaries for comparative purposes.

Unfortunately Wolverhampton was divided into only eight wards (Figure 3.22) and this seemed too coarse a sub-areal frame for the purposes in hand. The irregularity of ED boundaries (Figures 7.1, 7.2, 7.3 and 7.4), their variation in size and shape, the tendency of some to include narrow sectors almost from the centre to the town limits, and the temporal variation in numbers suggested that a wholly new set of units was required. It was therefore decided to distribute the sample of households for each ED to the appropriate 200 metre grid square to provide a set of small regular units from which larger operational grid squares could be compounded. This, it was thought, would provide a set of regular areal units fixed throughout the period and of smaller size than wards, which would facilitate temporal comparison. Several difficulties were encountered.

Although the present analysis includes factorial ecologies based on a grid square pattern, distribution of a household sample is not recommended.

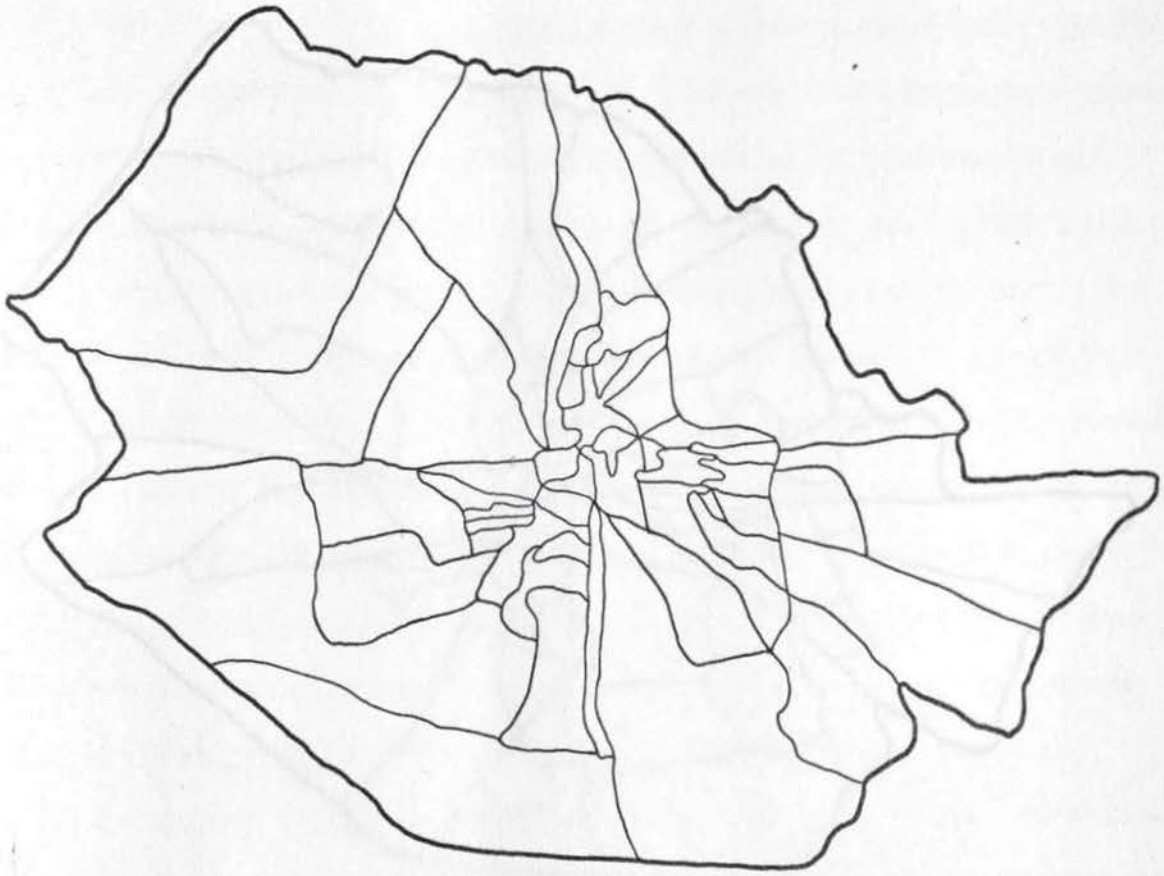


Figure 7·1 : Wolverhampton Enumeration Districts, 1841

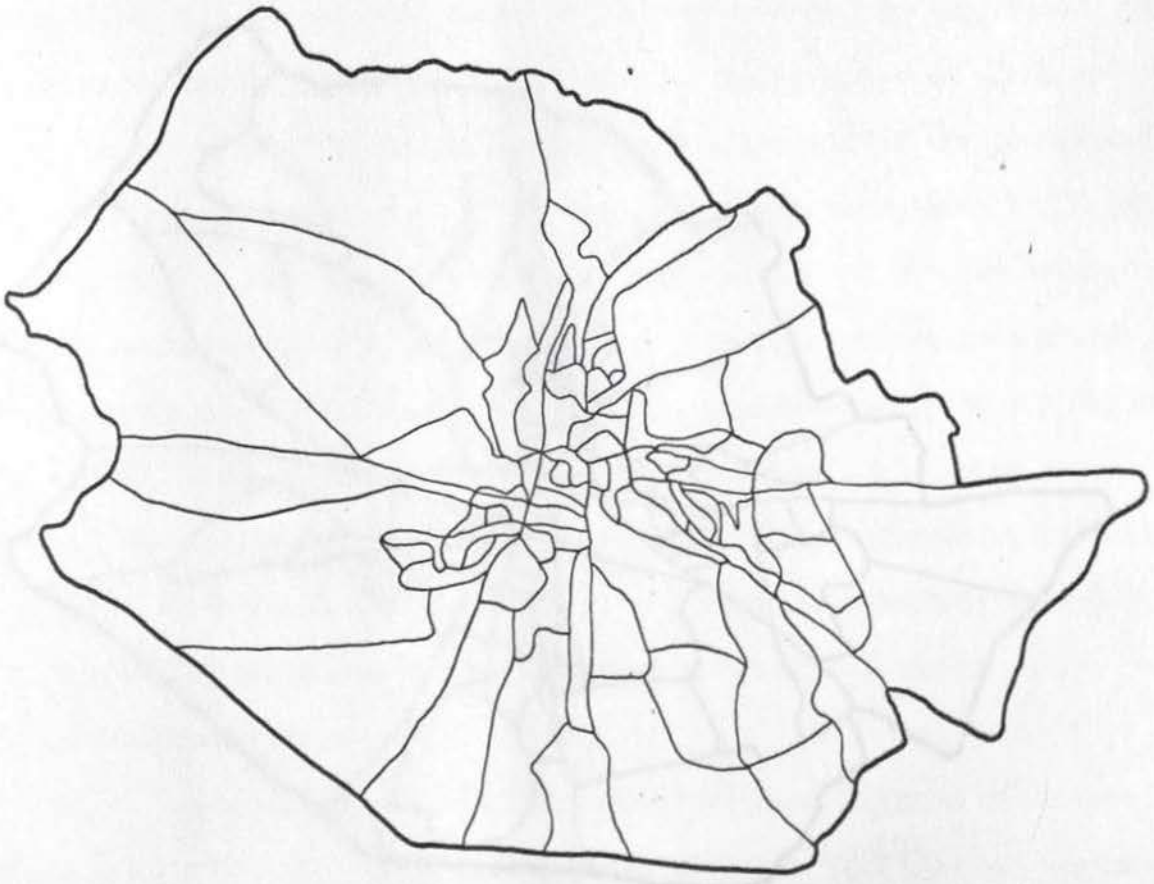


Figure 7·2 : Wolverhampton Enumeration Districts, 1851

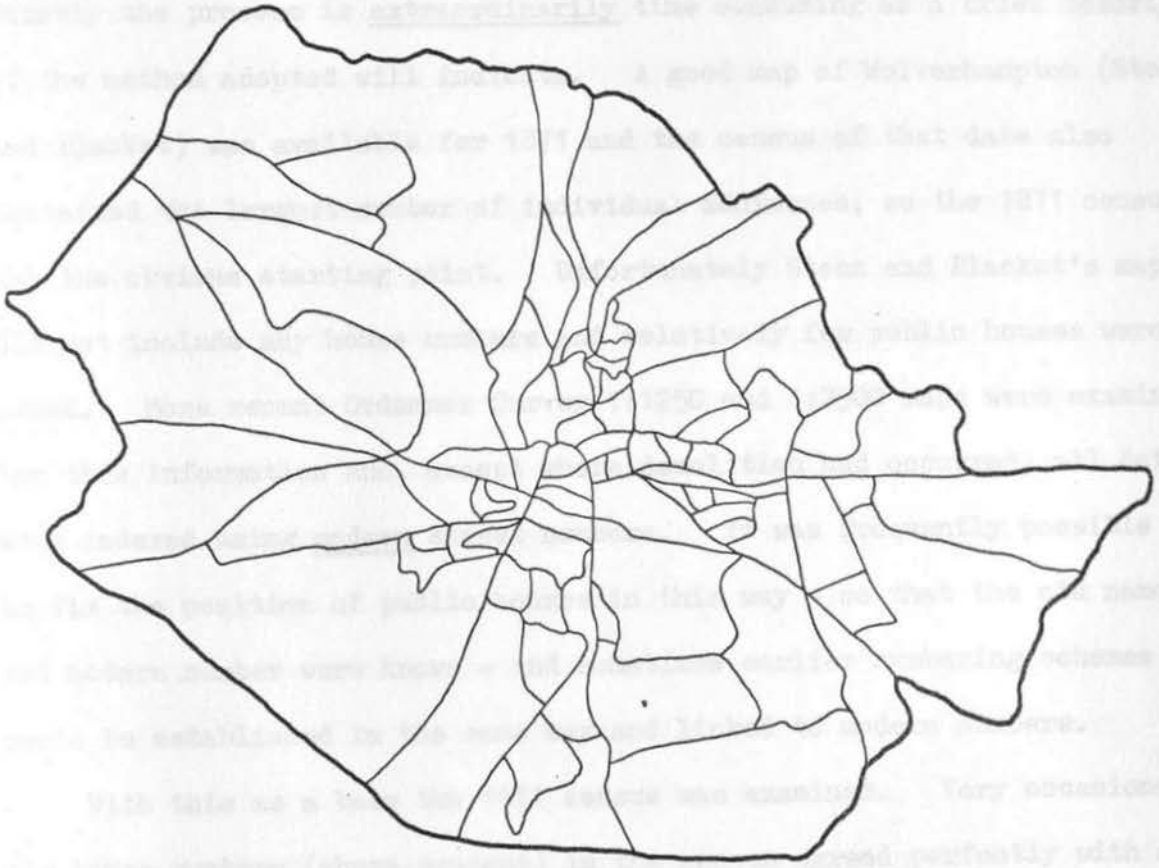


Figure 7·3: Wolverhampton Enumeration Districts, 1861

Figure 7·4: Wolverhampton Enumeration Districts, 1871

Firstly the process is extraordinarily time consuming as a brief description of the method adopted will indicate. A good map of Wolverhampton (Steen and Blacket) was available for 1871 and the census of that date also contained the largest number of individual addresses; so the 1871 census was the obvious starting point. Unfortunately Steen and Blacket's map did not include any house numbers and relatively few public houses were named. More recent Ordnance Survey 1:1250 and 1:2500 maps were examined for this information and, except where demolition had occurred, all data were indexed using modern street numbers. It was frequently possible to fix the position of public houses in this way - so that the old name and modern number were known - and sometimes earlier numbering schemes could be established in the same way and linked to modern numbers.

With this as a base the 1871 census was examined. Very occasionally the house numbers (where present) in the census agreed perfectly with a modern map or with an earlier numbering scheme that had been related thereto; this was easily confirmed by named properties (such as public houses) and by counting the number of houses between such markers. In these rare cases allocation to grid squares was simple, and often a large amount of additional information could be added to the modern index; this included names of more public houses, earlier names of pubs, locations of entries and yards relative to house numbers, etc. In most cases, even where house numbers were present, they did not relate in any way to any known numbering scheme and it then became necessary to try to fix the old numbering scheme relative to modern numbers again using named properties. Once this had been achieved all extra information possible was added to the modern index and slowly a sizeable directory of names of public houses and other businesses was built up and linked to the modern numbering scheme.

Areas without numbers sometimes posed no great difficulty because enumerators frequently went around their districts in a logical manner

and wrote up returns similarly. Hence a district comprising the north side of Temple Street, the west side of Snow Hill from Temple Street to Cleveland Street, the south side of Cleveland Street and the east side of Worcester Street from Cleveland Street to Temple Street might be enumerated with addresses in the order Snow Hill, Cleveland Street, Worcester Street and finally Temple Street. Clearly the enumerator began at the corner of Snow Hill and Temple Street and went clockwise round the block back to the same point. This was easily confirmed by the observed correspondence of publicans with properties known to be (have been) public houses. By looking up the publican's name in the trade directories of the period it often proved possible to discover pub names not given in the census returns. Similarly, contemporary numbering schemes were also established for some areas.

Where no logical progression around the district could be assumed it was necessary to make intensive use of trade directories. The first step was to look up every publican since named properties were the easiest to locate. This often produced a few fixed points in the street concerned but not enough to determine how the street was covered (north to south, or if both sides were listed the order in which they came). In such cases it was necessary to look up every person whose occupation suggested he might appear in the directory, and with the added evidence of street numbers that this provided it was usually possible to allocate the individual household to within two or three houses. Only when these two or three houses straddled a grid line was it necessary to delve deeper into available evidence. A few areas, however, proved almost impossible to treat with confidence: these were all outlying areas where street names varied even between censuses and where numbering was absent. In such cases the maximum range of possibilities and the most probable grid square location were both recorded.

With the considerable directory of public house names and other information derived from 1871, the 1861 census proved less difficult than had been feared, despite the smaller number of complete addresses. Very often confirmation for the interpretation adopted in 1871 was found in names of public houses or publicans listed in the 1861 census. Alternatively such confirmation might be derived from trade directories giving comtemporary house numbers or public house names. Occasionally, however, the evidence of 1861 was found to conflict with that for 1871. All such cases were noted, as was any extra information from the 1861 analysis. This was used to distribute the 1851 sample to grid squares, though in this case cartographic evidence was again available in some areas making the task much easier. Where conflict had been found between the evidence of 1861 and that of 1871, the 1851 census often suggested which interpretation was correct, and in one area it was necessary to revise the 1871 allocations completely in the light of clear evidence from both 1851 and 1861 returns. It was often necessary to examine the names and ages of all individuals in a particular street at all three censuses and so to isolate those who did not move between censuses before such linkage of locational information from one census to another was possible. One area (Monmore Green) posed outstanding problems, for both in 1851 and 1861 the enumerator had listed no street names whatsoever: everyone's address was given simply as "Monmore Green". Fortunately, all the street names were present in 1871 and by identifying non-movers it was possible to allocate the 1861 population to streets and so, using non-movers between 1851 and 1861, to allocate the 1851 population too. This would have been impossible if the streets had been longer, straddling more than the two grid squares, but as it was a street name very often indicated precise grid square location so reducing the number of doubtful cases to manageable proportions. For these more detailed reconstruction proved effective.

Finally it was possible to allocate all of the sampled individual households to grid squares in a way that did not conflict with any of the available evidence for a very large part of the town. Where this was impossible the doubt existed in all three censuses and it therefore seemed feasible to define a single set of areal units which would internalize all such dubious allocation so that all households allocated to the wrong grid square would, nevertheless, lie in the correct areal unit.

The second major problem led to this aggregation of 200 metre grid squares. Population density varied so sporadically that it proved impossible to define regular areal units including similar sample populations even in the central built-up area. The difficulty was compounded by the need for all units to achieve an acceptable sample population size at all three census dates. The regularity constraint was abandoned and so too was the demand that all areal units should be the same size: lower densities in peripheral areas made larger areal units inevitable. Finally, grid units were defined with constant boundaries over the three censuses in such a way that all areas of doubt described above were internalized, the shape was relatively compact and a minimum of 35 households or 200 individuals were included. The minimum of 35 households was adopted after considerable experimentation and repeated calculation of standard errors as a lower limit to acceptable random sampling errors. Although in 1851 five grid units fell below this level, most were well above it and on average each grid unit contained 55 households. Figure 7.5 shows the grid units adopted.

Were the analysis to be repeated, allocation of households to grid squares would not be attempted. Instead, standard areal units throughout the period would be derived by subdivision and amalgamation of EDs. This procedure would have the added advantage that sample sizes could very easily be equated using a variable sampling fraction. Standard error

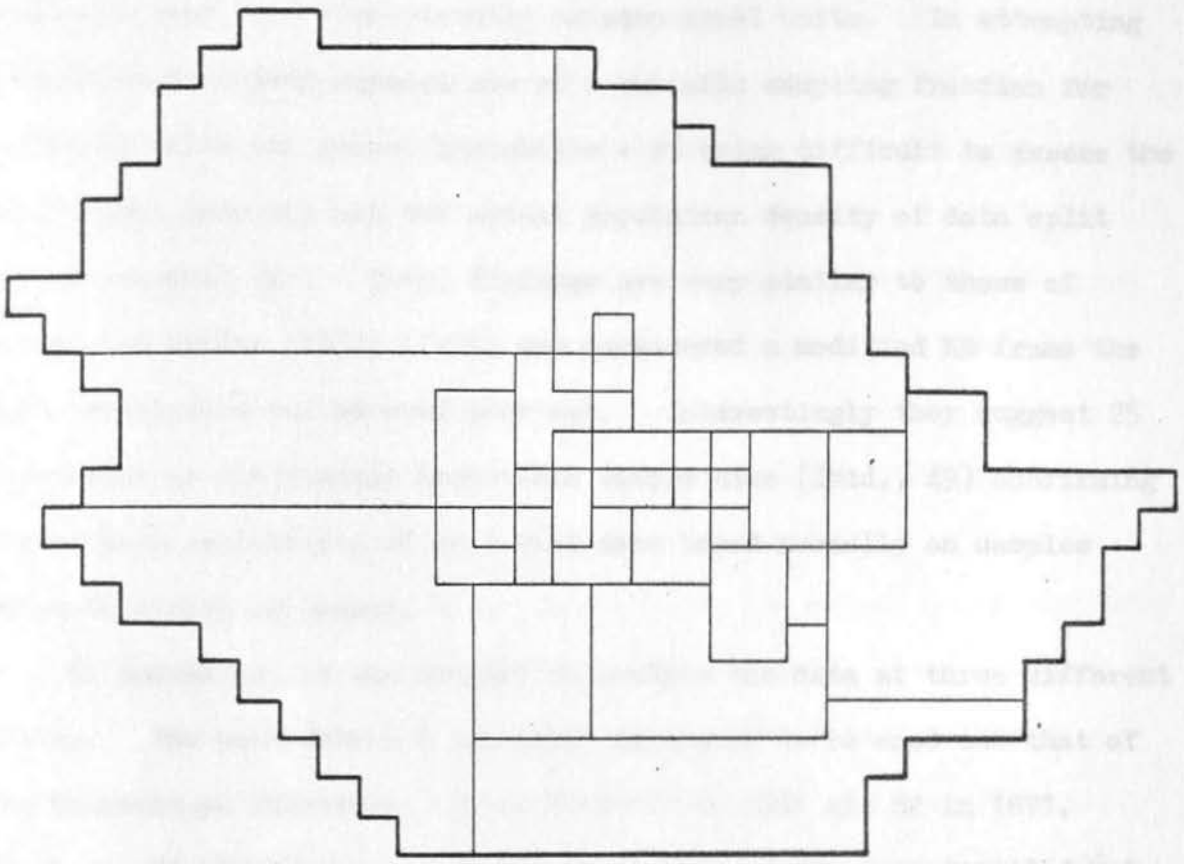


Figure 7·5: Wolverhampton Grid Units

would not then vary significantly between areal units. In attempting distribution to grid squares use of a variable sampling fraction for different units was almost impossible - it being difficult to assess the grid square location and the actual population density of data split between several EDs. These findings are very similar to those of Lawton and Pooley (1973, 47-54) who considered a modified ED frame the most practicable for general purposes. Interestingly they suggest 25 households as the minimum acceptable sample size (ibid., 49) confirming the overall reliability of grid unit data based normally on samples twice this size or larger.

To summarize, it was decided to analyze the data at three different scales. The most detailed sub-areal framework to be used was that of the Enumeration Districts: 74 in 1851, 77 in 1861 and 82 in 1871. Since the ED boundaries varied between censuses, the most detailed set of constant areal units to be used was the grid unit system of 35 sub-areas. The most aggregated level of analysis was to be by the eight wards. Comparisons based on different scales of unit should provide information regarding the effect of scale upon the analysis; temporal variations should be distinguishable from the effects of boundary changes in data based upon the fixed grid unit system.

7.3 Choice of Analytical Procedures

Although the value of the developing factor ecological approach in describing all three aspects of form, function and process has already been discussed it must not be assumed that a single method constitutes "factorial ecology". Factor analysis which, in a wide sense, includes component analysis too may be conceived of as three distinct steps at each of which important alternatives are available. The first step is preparation of a correlation matrix and the alternatives are R-mode (correlation between variables across the set of areal units) and

Q-mode (correlation between areal units across the variable set). If the aim of analysis is to define regions with similar characteristics then Q-mode analysis (Davies, 1972) provides a more direct approach than R-mode analysis followed by mapping of factor scores. For the present purposes, however, R-mode analysis is more suitable for it permits the identification of factors which may be thought of as representing the basic dimensions of residential differentiation. Since isolation of such underlying axes formed an important part of the problem under examination R-mode analysis was adopted.

The second step in "factor analysis" is the extraction of initial factors which summarize a large proportion of the total variation of the original data in a very much smaller number of factors. Factors may be 'defined' as in principal components analysis or 'inferred' as in factor analysis proper. Defined factors are new composite replacement variables that are not correlated with each other and are here referred to as (principal) components. The first component is the single best summary of linear relationships present in the input data; the second component is the linear combination of variables that accounts for the most residual variance after the first component has been removed. Principal components analysis may therefore be regarded as a technique for data reduction and parsimonious description in which a large number of variables are replaced by components which are linear combinations of, and equal in number to, the original variables but a small number of which will account for a large proportion of the variance in the input data. As such principal components analysis may be considered an exploratory technique. By contrast, the inferred factors of factor analysis are based upon the assumption that the total variance contributed by each variable can be divided into that which is unique to the variable concerned and that which is shared with other variables. The object of

factor analysis is to define a minimum number of hypothetical variables, or factors, so that after controlling for these all the remaining correlations between variables is zero. There are, however, different methods of estimating the amount of shared variance (or the communality) of each variable. The assumption that part of total variance is random 'noise' while the remainder is due to common factors suggests that factor analysis based upon inferred factors is ideal as a hypothesis-testing technique. Timms (1971, 48-9) confirms the essentially blind and investigative character of principal components analysis when compared with other factor analytic procedures, while Harman (1960) provides an extensive technical treatment of the subject.

The third step in analysis is rotation of the initial factors to a terminal solution with the object of deriving interpretable factors or simple structure (Thurstone, 1947, 335) in which factors have strong loadings from a relatively small number of variables and in which each variable loads strongly on a small number of factors. Two types of rotation are possible: orthogonal with factors uncorrelated and oblique where no such condition is imposed; within these types many different criteria are available.

Unfortunately the literature is not particularly helpful in choosing between available alternatives. By far the most popular methods are principal components analysis followed by a varimax (orthogonal) rotation and principal axis factor analysis also followed by varimax rotation. This stems partly from the early availability of package programs for these two approaches and may not form a reliable guide. Mather (1973) criticizes continued reliance upon these methods now that new techniques are available which are free from the influence of scale of measurement and also allow computation rather than estimation of factor scores. Mather therefore advocates the use of image analysis and maximum likelihood

methods, though alpha analysis is also favourably regarded. Detailed examination of the views of many different writers revealed no clear reason for preferring one approach rather than any other and comparison of the alternatives seemed the most acceptable means to resolve the impasse. Similar comparisons were performed by Mather (1973), and Rees (1972) describes an image analysis and a component analysis of the same city as a "Tale of the Two Montreals". Davies (1973, 4) comments "If we are not to lose faith in the possibility of comparative research, then a technical review of the advantages and appropriateness of the various procedures using an accessible data source is long overdue." It was in the absence of such guidance that comparison was undertaken of some of the alternative techniques. The comparisons extended to include alternative factoring procedures and rotations.

A similar approach was adopted in connection with two other important questions. Firstly there was the problem of whether and how to weight the data unit. A considerable literature stresses the importance of weighting in correlation analysis of areal data based on units of different sizes (e.g. Robinson, 1956). Comparison of successive censuses would be affected by the changing proportion of the total population within each grid unit. To assess the significance of this unweighted analyses were compared with those weighted by population size. Secondly, a similar question relates to the value of variable transformation to achieve a normal distribution; factor analysis is most effective when variables are normally distributed and the relationships between them are linear. Murdie (1969) takes great care to select appropriate transformations, whereas many studies use only a logrithmic transformation. The distribution of each variable included here was examined and nine of the 26 were regarded as needing transformation. After considerable experimentation, a logrithmic transformation was performed on six (01, 03,

16, 23, 24 and 25: see Table 7.1) and a square root transformation on the remainder (07, 08 and 17). Analyses in which these transformations were used were then compared with analyses without transformation.

The programs used were those available in the Statistical Package for the Social Sciences (Nie et al., 1970). The major advantage of this package was the number of different factoring and rotational procedures present, and the ease with which transformations and weightings could be performed. Apart from similar packages it would have been necessary to "de-bug" several different programs in order to compare different techniques. In the light of experience, however, the advantages of SPSS are seen to be less than was originally thought. Not only is the package rather incompletely documented, but as soon as it fails to meet the user's needs it is necessary to get expert assistance before the source program can be altered. Considerable problems were encountered in using the matrix inversion routine to calculate factor score coefficients. Had an ordinary program been in use the present user could have experimented with several alternative procedures developed (more recently than SPSS) by the Numerical Algorithm Group. As it was, however, a member of Computer Applications spent two months trying to locate the source of the trouble before agreeing to modify the SPSS source program. While the results presented here were produced by SPSS, it is clear that similar results could have been obtained more rapidly using individual programs: the range of analytical techniques used would, however, have been rather narrower.

7.4 Treatment Of Temporal Change

Of all the methodological issues that of the treatment of temporal change was the most crucial, for adequate testing of the hypotheses under consideration demands the careful definition of evolving factor or component structures. The importance of this part of the analysis made

Table 7.1 Variables Used in the Analysis

CODE	DESCRIPTION OF VARIABLE	INDICANT OF WHICH DIMENSION?
01	Percentage of occupied population[1] in classes I or II*	Socio-economic Status (class, servants, child employment)
02	Percentage of occupied population[1] in classes IV or V	
03	Mean number of domestic servants per household*	
04	Percentage of heads' children[2] aged 5-14, working	
05	Percentage of heads' children[2] aged 15+, working	
06	Percentage of labour force[3], female	Family Status (female participation, fertility, life cycle stage)
07	Percentage of household heads, female**	
08	Percentage of heads' wives, working**	
09	Percentage of households with high fertility pattern*	
10	Fertility ratio (children0-4/females 15-44)	
11	Percentage of heads with children[2]	
12	Percentage of sample population aged 65+	
13	Mean age of household heads	
14	Percentage of sample population born in Wolverhampton	Ethnic Status (birthplace, overcrowding, immigrant community characteristics)
15	Percentage of heads, non-local English or Welsh[5]	
16	Percentage of heads, Irish, Scottish etc.[6]*	
17	Sample population per occupied[7] 200 metre grid square (Density**)	
18	Number of family nuclei[8] per 100 households	
19	Sex ratio (males/100 females)	
20	Percentage of males gainfully occupied[9]	
21	Mean number of persons per household	Household Complexity
22	Percentage of households containing non-kin[10]	
23	Percentage of non-kin "loners"	
24	Percentage of sample population in mining occupations*	Occupation
25	Percentage of sample population in dealing occupations*	
26	Percentage of sample population in manufacturing occupations	

Footnotes:
1 Includes those retired persons attributed a former occupation in the returns.
2 Children of the head or head's spouse.
3 Excludes those retired, pensioned and of private means.
4 Based on average interval between all (heads) children present.
5 Born in England and Wales outside the three West Midland counties.
6 Includes all born outside England and Wales - abroad, at sea and the few unknown.
7 Excludes large areas of unoccupied farmland, mining areas etc.
8 Husband/wife or parent/child relationships involving neither the head nor head's spouse.
9 Excludes retired unless an income is indicated.
10 Non-kin are persons related neither to the head nor head's spouse; loners are related to no other household member.
* Logrithmic transformation used.
** Square root transformation used.

reliance upon a single technique inadvisable, and three different approaches were adopted.

Firstly, factor analysis was applied not to the value of variables at one census, but to the changes in those values between censuses. Johnston (1973, 81) uses such a technique, while Murdie (1969) employs similar but standardized coefficients of change. Both examine relative change (i.e. the magnitude of change compared with the initial value of the variable) but this was found to produce a confused pattern; slightly more successful was analysis of crude change in the value of each variable. While crude change takes no account of the level at which changes occurred - equating a rise in the proportion of Irish from 1 to 6% with a rise from 45 to 50% - it removes the extremely high values produced by moderate growth on an infinitessimal base. The major disadvantage of analysis of a matrix of change was found to be its dubious relevance to the hypotheses under examination: the output was a set of "dimensions of change" when what was required was a description of the change in the dimensions of residential differentiation.

The second approach to the question of temporal change proved more useful, being based on a verbal comparison of the factor or component axes from successive censuses. By examining the variable loadings on similar components for successive censuses it proved possible to isolate detailed changes in the dimensions of residential differentiation. Though this procedure was found to be very sensitive to small changes it was often difficult to conceptualize these, and labelling of the axes was therefore undertaken to characterize (and even caricature) the essential features of the evolving pattern. Attempts to provide such names for components demonstrated that concise labels are rarely sufficiently informative to be useful; hence the names used in the following chapters are often uncomfortably long. Various conventions were adopted in devising the labels, and these may usefully be described here.

First, the order in which key words occurs is intended to indicate the importance of the various facets of composite dimensions; parentheses serve a similar function by suggesting additional aspects of the axis. Secondly, account is taken of strong positive and strong negative loadings since many variables might have been presented so as to load in the opposite direction. (Sex ratio might have been females per 100 males rather than the reverse.) This view is confirmed by Davies' criticism (1973, 6) of King (1969) for ignoring negative loadings. Thirdly, to indicate continua where no accepted concept (such as social status) exists, polar types are separated by an oblique (/); where possible the type associated with positive loadings appears first.

Verbal comparison was felt to be too subjective for complete confidence and the third approach to temporal change therefore attempted to quantify the degree of similarity between successive structures using congruence coefficients. The procedure adopted is described by Veldman (1967, 236-44) though minor modification was necessary before the program would run. As Veldman notes (ibid., 236), once a structure has been determined the question of invariance naturally arises and his program, RELATE, offers a way to measure the similarity of component structures derived from successive censuses. Designed for application to structures with orthogonal reference axes, RELATE produces three matrices suggesting the similarity between the two structures being compared: (1) a matrix of cosines among factor axes, which can be interpreted as correlations between the component axes in the two analyses; (2) a re-rotation of the second component structure which maximizes its resemblance to the first structure. Transformation is achieved by applying the matrix of cosines to the second component loading matrix; the result is a matrix containing a new set of loadings. (3) When the second structure has been re-rotated, the constancy of individual variables across the two

analyses may be measured by calculating the cosine between test vectors in the first structure and the corresponding test vectors in the newly aligned structure.

The value of these three types of output varied greatly. Most useful was the matrix of cosines amongst component axes (1) for very similar axes were clearly identified by high correlations. Where the similarity was less, correlations were weaker and there were often similar correlations with other components too. Though the similarity between one component in (say) 1851 and two components in 1871 was easily explained when the variable loadings were examined, this missed the point - for in such circumstances the subjectivity of verbal comparison was unavoidable. The re-rotated component loading matrices (2) proved to be of limited value. After realignment the second matrix always resembled the first family closely (even when artificially dissimilar structures were input) and the reason for this is obvious. The matrix of cosines amongst factor axes (1) measures the similarity of the two structures and is then used to realign one of them: the greater the initial differences the more drastic the transformation effected. It had been thought that differences between the first structure and the re-rotated second structure would indicate real differences between the patterns of residential differentiation at the two dates. Instead the differences proved trivial. The third matrix output by RELATE was only slightly more useful, allowing variables which behaved differently in the two analyses to be pinpointed.

Broadly, therefore, the matrix of cosines amongst the component axes was the most useful part of the output; when supplemented by verbal comparison it was judged to offer an acceptable technique for the temporal comparison of factor and component structures.

PART THREE

RESULTS AND CONCLUSIONS: THE ECOLOGY OF SOCIAL CHANGE

INTRODUCTION TO PART THREE

In Part One an attempt was made to develop a theoretical framework for the analysis of patterns of residential differentiation, with particular attention devoted to process and function. The central hypothesis was of an evolution in the dimensions of residential differentiation during rapid industrialization and urban growth. The form which this evolution might take was examined in detail, and the suitability of nineteenth century Wolverhampton as a test-bed for such ideas was demonstrated. Part Two considered problems of hypothesis testing, and in particular the suitability of nineteenth century census data for this purpose. The Returns were found to meet most theoretical requirements well, and the precise analytical procedures were elaborated. Part Three presents the results and conclusions of these analyses.

Because the present study compares conclusions based on analysis of data for different areal units or derived by alternative analytical techniques, description of results becomes a complex - and potentially repetitive - matter. For this reason, Chapter 8 reports the results of <u>one</u> type of analysis (principal component analysis with varimax rotation) of <u>one</u> type of data (transformed and weighted grid unit data). Chapter 9 considers the stability of the conclusions across other areal units (including EDs which vary between censuses) and using alternative techniques. The value of analysis of matrices of inter-censal change is also examined. Chapter 10 then addresses the question of spatial form, suggesting that - given suitable areal units - mapping of component scores can form the basis for a description of urban residential patterns as these were expressed spatially. Finally the degree of congruence between social patterns in nineteenth century Wolverhampton and spatial variations in the quality of the residential environment is examined; this is seen as a step towards the desired form-function-process view of urban residential structure.

Chapter 11 draws together the overall conclusions of this work as they relate to the Enumerators' Returns, to the methodology adopted, to the residential structure of the urbanizing city, and to the possible directions for future research. Adoption of a complete form-function-process approach is seen as the most likely means of ensuring further advnaces in understanding. Appendices present a large amount of material which, for the sake of clarity, is only summarized in the main text.

CHAPTER 8 THE ECOLOGY OF SOCIAL CHANGE: WOLVERHAMPTON 1851-1871

In the theoretical framework developed in Part One it was suggested that temporal evolutions in the dimensions of residential differentiation occurred during periods of rapid industrialization and urban growth. It was also argued that, for Wolverhampton, the years 1851-1871 formed part of such an era of change. The present Chapter considers the empirical evidence for such an hypothesis. Two main types of material are used: written evidence is used to describe the contemporary background and Enumerators' Returns are used as the basis for factorial ecologies. It is argued that comparison of successive component structures reveals changes in the dimensions of residential differentiation. Both sources reveal gradual movement - away from the pre-industrial and industrializing and towards the modern urban pattern.

8.1 Wolverhampton 1851

8.11 The Contemporary Background

Wolverhampton's population rose from 36,382 in 1841 to 49,985 in 1851 as the expansion of industrial employment led increasing numbers to concentrate in the urban area. More and larger factories were built, migrants were drawn in from the West Midlands and Ireland, and overcrowding of the central areas increased rapidly. As infilling and overcrowding raised population densities in the central areas, the threat of a cholera epidemic at last became obvious (Jones, 1903, 53). There was still no proper sewerage system; a few shallow drains emptied into old streams, but most of the filth lay in open middens and cesspools behind the dwellings. An open ditch on the east of the town wound into Stow Heath Brook, another on the west into Graiseley Brook, while "The Black Brook" ran across Salop and Darlington Streets in a covered drain, spreading its contents over the meadows beyond. A town of crowded courts, crooked streets

and unhealthy houses was a hot-bed of disease. In October 1848 the Council petitioned the Government to sanction adoption of the new Public Health Act in the town, and a Commissioner was sent to investigate, but while the matter was still undecided cholera broke out (1849).

The poor living along Willenhall Road, on the east of the town, were first to suffer: whole families died in miserable shanties set amid stagnant pools which had collected in disused coal workings. The epidemic spread to the crowded slum courts where drainage was absent and filth lay in heaps. But well-to-do families were attacked too; a leading ironmaster died, and alarm increased daily as strong, healthy individuals sickened. At the height of the epidemic the Board of Guardians sent out carts at dusk to collect the dead. As a last resort the poor were moved into military bell tents while their houses were disinfected (General Board of Health 1850, 114-5), and the epidemic subsided. The causes of the outbreak received some attention. The mayor urged the Council to provide a complete sewerage system, and plans were made of existing drainage; Mr. Peter Bell, a physician of Cock Street, claimed that the seats of the disease were supplied by water pumped from coal workings. But despite the clamour, little was done: even extension of the Public Health Act to Wolverhampton was delayed.

Several aspects of Wolverhampton's public health problem merit attention. It is clear, for example, that poor housing was of two types: shanties amidst coal workings, and overcrowded slum courts. Secondly, the east of the town fared worst, with poor housing concentrated there. The spread of cholera to the better-off indicates the relative proximity of the classes and a small scale pattern of differentiation. Though the west of the town was more favoured, the existence of Black Brook probably explains the deaths amongst those of higher status. Even in the better areas there were pockets of low quality housing where the poor were concentrated.

Concentration of the Irish amongst the urban poor is another pre-occupation of contemporary literature (e.g. Select Committee on Poor Removals, 1847, 300). The case of Catherine Murphy (ibid., 1854) is particularly valuable in suggesting Irish migration patterns. Catherine, born in Dublin in about 1828, married William Murphy in July 1845, and the couple went to England in 1846 - first spending two years in Derby, and then moving to Wolverhampton, where they remained except for three months "at the time of the cholera, in 1849". They and their children first received relief in late November 1849; after two months they were ordered to the Workhouse to be sent to Ireland, but instead left the town - returning less than a month later. About three weeks after her return Catherine went to the relieving officer seeking medical assistance for a woman living in the same house with her, and was seemingly kidnapped - being taken to the railway station where she was told that she was being sent to Ireland. Her infant son John was sent too; her husband and another child remained and she was not permitted to communicate with them before leaving. She objected to being sent to Ireland, but the party having charge of her said the Poor Law Guardians had ordered it. Though the Wolverhampton Guardians contested certain features of this story, key elements stand out. Firstly the initial move from Ireland occurred at one of the most likely life cycle stages, for the two moved to Derby shortly after their marriage. Secondly migration was a two-stage process. Thirdly, residence in Wolverhampton was less permanent than for a family which had bought a house there and obtained regular employment. It should be noted, however, that the couple's behaviour was not so aimless as to match the traditional nineteenth century view of feckless, rootless, migratory Irish workers. They left Wolverhampton during the epidemic, but returned later and apparently intended to stay until driven out by a fear of deportation. Finally there is a hint of multiple occupancy of housing typical amongst the Irish.

The evidence of Andrew Doyle, a Poor Law Inspector, (ibid., 1855, 169-90) is also inconsistent with the view of the Irish as rootless. "The Irish of ... Birkenhead, ... Chester ... and Wolverhampton, have fixed residences; they reside in the places of their industry." Clearly a permanent Irish element in Wolverhampton would have a far better chance of assimilation than a continually changing stream of wandering paupers. Doyle also stressed that although poverty amongst the Irish in Wolverhampton (with about 1 in 20 in the workhouse) was worse than that amongst the English (1 in 30), both groups suffered in periods of cyclic depression. An examination of contemporary labour relations reveals some discontentment amongst poorly paid workers - whatever their origin.

The Tinmen's Strike (1850), though unrepresentative of the normal situation, suggests underlying trends. Edward Perry (1850), an important tin manufacturer, published a reply to remarks in the Wolverhampton Chronicle, 20 November 1850, which had broadly favoured the strike. Expressing concern for the "vital interests of the town and trade of Wolverhampton" - coincidentally identical with his own "humble personal interests" - Perry stressed that his capital "..... materially promotes the interests of ..... numerous shopkeepers, professional men, and other inhabitants". The threat was then made explicit: "Although I and the majority of japan and tin goods manufacturers whom the Trade Unionists are opposing may, at present, have no intention of removing our establishments to other quarters, or withdrawing our capital from the business, ... we shall ... ere long have to embrace one or other of these alternatives, unless we receive due and adequate protection from the local authorities in the legal enforcement of those contracts with our men which ..... constitute our only immediate safeguards against the falsehood, bribery, cajolery, intimidation, intoxication and other unscrupulous expedients

indefatigably and systematically resorted to for the purpose of seducing ..... otherwise contented workmen from their situations" - which tactics, Perry claimed, were used to lure men into rival branches of trade in Birmingham and London. Trade Unionists' interests lay in maintaining ill-will between "the masters as a class, and the men as their natural opponents" by preventing all compromise to the ostensible benefit but actual harm of working men.

Before 1851, therefore, there is evidence of a move towards class conflict and of its crystallization in class attitudes and language. Foster (1968) stresses the effect that the degree to which labour was united had upon social structure and housing patterns. Wolverhampton never reached the level of conflict which he describes in nineteenth century Oldham, but it is instructive to compare the chronology of an emerging class consciousness with the development of an independent social status dimension, and to examine the implications of such changes for the residential segregation of the working classes. The norm in Wolverhampton was of little political and trade union activity (cf. Lawton and Pooley, 1975, 28 regarding Liverpool) and in 1850 Perry was correct in referring to "otherwise contented workmen". But class consciousness and conflict was beginning to emerge: there was an upsurge of labour disputes to a peak in 1865 (discussed later) and by 1850 the seeds were already sown.

By the time of the 1851 Census therefore the strain of industrialization was becoming apparent. The increasing number and size of factories gave rise to disputes between working men and their masters - particularly when cyclic depression reduced the amount of work available. The general expansion of employment, however, continued to attract large numbers of impoverished migrants, amongst whom the Irish formed a prominent and identifiable group. Moreover, this increasing urban population was accommodated by crowding into hopelessly insanitary courts and back streets.

It is against this background that the factorial ecology of Wolverhampton in 1851 must be seen. Change was underway: population was growing rapidly, large factories were becoming increasingly important, immigration - particularly of the Irish - was swelling to a flood and class conflict was beginning to emerge. But aspects of the pre-industrial pattern persisted: urban facilities were poorly developed, control mechanisms were inadequate, large factories were still very much an innovation in many industries and class attitudes had yet to harden. In 1851 therefore elements of the pre-industrial and modern patterns existed side by side.

8.12 A Factorial Ecology of Wolverhampton 1851 by Grid Units (GU1851)

Before detailed discussion of the component structure in 1851 is attempted it is desirable to examine the correlation matrix which formed the raw material for the analysis and may therefore offer insights into the patterns revealed. To ensure that the 26 x 26 correlation matrix could appear complete on a single page, and for the sake of interpretability, it is presented in summary form (Table 8.1). Since the matrix is symmetrical about its diagonal only half of it is represented. It is instructive to identify those variables with many correlations stronger than an arbitrary value of 0.5. Variable 03 (servants) was, by this criterion, related strongly with ten others including indicants of socio-economic status (01, 02 and 05), household complexity (22 and 23) and occupation (24 and 25). Variable 01 (% in class I and II) was similarly strongly linked with seven other variables. Both 03 and 01 were selected to reflect the socio-economic status axis which, it has been hypothesized, was particularly important in explaining spatial variations in social character. Strong correlations are with other measures of socio-economic status, negatively with fertility ratio (10), maleness and male occupancy rates, and positively with loners and with dealing occupations (23 and 25).

Table 8.1 Summary Correlation Matrix: GU1851

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
01	1																									
02	-	1																								
03	+	-	1																							
04				1																						
05			-		1																					
06						1																				
07						+	1																			
08						+		1																		
09									1																	
10	-		-							1																
11										+	1															
12												1														
13			+		+	-	+	+		-		+	1													
14														1												
15															1											
16														-		1										
17																	1									
18		+												-		+	+	1								
19	-																	+	1							
20			-		+				-											1						
21														-		+	+	+			1					
22			+							-	-			-		+						+	1			
23	+	-	+															-	-					1		
24	-		-	+																				-	1	
25	+		+			+	+			-	-												+	+	-	1
26														+												1

Key:-

1 = 1.0
\+ +0.5
\- -0.5

The strong association between high status and loners presumably results from the presence of domestic servants and of shopmen etc. in high status dealing households. Of particular interest is the strong negative correlation between status and mining occupations. The remaining socio-economic status indicants (02, 04 and 05) have fewer "strong" correlations, but low status (02) was linked with multiple occupancy (18) and negatively with loners (23). Child and adolescent employment rates (04 and 05), though related to other status measures, tended to be high in areas of mining employment (24), high male occupancy rates (20) and young household heads (13).

Variables measuring occupation proved particularly interesting. Dealing (25) scored nine correlations stronger than ± 0.5, including indicants of (high) socio-economic status, (many) non-kin and loners, (high) female participation and headship rates and (low) fertility. The strong negative correlation with mining (24) indicates a clear separation of the two occupations at grid unit level. Manufacturing (26) is strongly related with neither, suggesting that while mining and dealing tended to occur in different areas, manufacturing was far more evenly spread - though particularly concentrated in areas where much of the population was Wolverhampton born (14). Mining, it will be noticed, is associated with low socio-economic status, dealing with high status. Their spatial separation gives at least some credence to the idea that spatial differentiation by occupation existed prior to the transport revolution; but, even at this early stage, differences in status were considerable.

Variables indicating household complexity (22 non-kin, and 23 loners) were well represented in correlations stronger than ± 0.5, but family status indicants fared badly with only 10 (fertility ratio) and 13 (mean age of head) worthy or particular notice. This might be held to suggest

that the variables selected were - in fact - only poor indicants of the theoretical dimension. It seems more probable, however, that no unified 'family status' axis had emerged by 1851 and that isolated elements thereof existed only in embryonic form. Hence there was a strong positive association between variable 10 (fertility ratio) and variable 11 (% heads with children) and a similar correlation between variables 06 (% labour force, female) and 07 (% households with female heads), but no indication of a strong negative assoication between variables 10 or 11 (reflecting familism) and variables 06 or 07 (reflecting feminism).

Of the indicants of ethnicity and migration only multiple occupancy (18) showed many "strong" correlations, and this may be dismissed as part of household complexity differences rather than revealing an ethnicity axis. If all the correlations of variables 14 to 20 which are stronger than ± 0.5 are examined, two types of relationship emerge. Firstly, the supposed indicants of ethnic status are related with each other, and secondly they are linked with measures of (low) status. This is an important conclusion which raises doubts about the supposed independence of the ethnicity dimension; in most conceivable circumstances immigrant/native differences are unlikely to be independent of social status.

The Components Loading Matrix

Table 8.2 shows the components loading matrix for 1851 by grid units (hereafter GU1851) with seven components accounting for 81.4% of total variance. All components whose eigenvalues exceeded 1.0 were interpreted both because the seven component solution proved more meaningful when factor comparison procedures were adopted - interpretation of the congruence coefficients being easier - and because it seemed undesirable to ignore the large proportion of total variance unaccounted for by a three- or four-component solution. Description of seven components for three levels of analysis at each of three censuses is apt to prove tedious, however, as

Table 8.2 Components Loading Matrix: GU1851

GU1851	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	0.79	-0.17	0.28	0.16	0.15	-0.19	0.04
02	-0.68	0.44	0.03	-0.12	0.09	0.05	0.00
03	0.82	0.10	0.12	0.43	-0.05	0.00	0.13
04	-0.53	-0.08	0.02	-0.07	-0.45	0.47	0.24
05	-0.37	-0.13	-0.05	-0.67	-0.02	0.23	-0.04
06	0.27	0.01	0.77	0.13	0.31	-0.08	-0.07
07	0.24	-0.04	0.82	0.04	0.08	0.13	-0.01
08	0.11	-0.02	0.35	0.05	0.75	-0.14	0.17
09	0.22	-0.02	-0.22	0.24	0.07	-0.20	0.82
10	-0.66	-0.49	-0.39	0.03	0.16	-0.04	0.13
11	-0.57	-0.22	-0.28	0.01	0.05	0.08	-0.46
12	-0.06	-0.09	0.34	0.81	-0.10	0.03	0.16
13	0.31	0.24	0.58	0.50	0.06	-0.02	-0.22
14	0.08	-0.74	0.02	0.18	0.50	0.32	-0.08
15	0.05	-0.06	-0.05	0.10	0.01	-0.81	0.16
16	-0.03	0.87	0.09	0.06	-0.05	-0.00	0.20
17	0.10	0.61	-0.03	-0.14	0.20	0.55	-0.07
18	-0.29	0.89	0.06	-0.07	-0.08	0.09	-0.11
19	-0.39	0.52	-0.26	-0.21	0.17	0.32	0.19
20	-0.49	0.18	0.25	-0.63	-0.11	0.23	-0.14
21	0.02	0.88	-0.08	0.19	-0.06	0.11	-0.18
22	0.54	0.74	0.15	0.06	-0.10	-0.09	0.12
23	0.74	-0.42	0.25	-0.03	0.06	-0.03	0.17
24	-0.70	0.19	-0.09	-0.13	-0.49	0.01	-0.02
25	0.74	0.28	0.29	0.14	0.11	0.09	0.14
26	-0.14	-0.26	0.07	-0.34	0.66	0.35	-0.09
% VARIANCE	29.6	20.6	10.5	6.6	5.5	4.7	4.1

variable loadings for each are catalogued and interpretations listed. For this reason a shorthand form is adopted when (as is usual) this is suitable. For each component four types of variable loading are listed: strong positive loadings (+0.7 or greater), moderate positive loadings (+0.4 to +0.69), strong negative loadings (-0.7 or stronger) and moderate negative loadings (-0.4 to -0.69). The variables are listed within these four groups from left to right in order of decreasing strength. Hence, in the list that follows, the strongest positive loading on GU1851 Component I is variable 03 (servants per household). When this method is unsuitable (e.g. if few loadings are stronger than $\pm$0.4) it is modified as necessary. To further reduce the need for cataloguing variable loadings much of the detailed interpretation of analyses presented in Chapter 9 is placed in Appendices.

Once loadings have been presented the component is interpreted and an appropriate label proposed. It must be emphasized that labels were selected within the framework of the study as a whole and not based solely upon the pattern of loadings on a particular component in one particular analysis. The object being to highlight changes in component structure, labels caricature differences compared with similar axes in other analyses as well as indicating the theoretical analogue of the dimension involved.

GU1851 Component I

Loadings +0.7 or higher, variables 03 (servants) and 01 (% class I and II).
Loadings +0.4 to +0.69, variables 25 (dealing), 23 (loners) and 22 (non-kin).
Loadings -0.7 or lower, variable 24 (mining).
Loadings -0.4 to -0.69, variables 02 (% class IV and V), 10 (fertility ratio), 11 (heads with children), 04 (% children 5-14 working) and 20 (% males gainfully occupied).

Component I embraces not only socio-economic status variables, but also indicants of occupation, household complexity and family status. It distinguishes between two polar type areas in Wolverhampton, 1851. On the one hand, were areas of relatively high social class where servants

were common and dealing an important occupation; in addition, many household members were not related to the household head - servants, shopmen, waitresses etc. The pattern was apparently conditioned by business needs in a period when separation of home and workplace was a very real possibility for more affluent traders: hence there were fewer children - traders with families being amongst the first to leave. With relatively few in the lower classes there was less need for child employment. On the other hand, were mining areas away from the main retailing zone, where social class was lower, servants were rarer and the need for young children to find profitable employment greater. Proportionally more heads had children and fertility ratios were correspondingly higher. Unexpectedly high, in view of the number of children, were overall male activity rates; this was due - at least partly - to the high levels of child employment, which was mainly of young males. To capture the multi-faceted character of Component I it was labelled Social Status Occupation, Household Composition).

GU1851 Component II

Loadings +0.7 or higher, variables 18 (multiple occupancy), 21 (household size), 16 (Irish) and 22 (non-kin).
Loadings +0.4 to +0.69, variables 17 (density), 19 (sex ratio) and 02 (% class IV and V).
Loadings -0.7 or lower, variable 14 (Wolverhampton born).
Loadings -0.4 to -0.69, variables 10 (fertility ratio) and 23 (loners).

Five of the seven indicants of ethnic status provided loadings stronger than ± 0.4 on Component II. The archetypal immigrant area of 1851 was clearly one of recent immigration. In areas with a high proportion of Irish heads, households were large containing many family nuclei and non-kin; residential densities were high, there was an excess of males and social class was low. Children were relatively few and non-kin tended to live in separate family nuclei rather than as loners. By contrast, areas with large proportions born in the town were less crowded, contained more children and contained relatively higher proportions of loners.

The Irish areas, forming one polar type, were clear examples of a newly immigrant community, with overcrowding, an excess of males and few children in addition to ethnic differences. Component II was therefore labelled Newly Immigrant Community.

GU1851 Component III

Loadings +0.7 or higher, variables 07 (% households with female heads) and 06 (% of labour force, female).
Loadings +0.4 to +0.69, variable 13 (mean age of head).
Loadings -0.4 or lower, absent, though variable 10 (fertility ratio) provides a loading of -0.39.

By differentiating between areas with many female heads, a high level of female labour force participation, few children and rather old household heads on the one hand, and those with more children and younger, dominantly male heads on the other, Component III suggests an embryonic family status axis narrowly based on Feminism (and Age).

GU1851 Component IV

Loadings +0.7 or higher, variable 12 (% aged 65+).
Loadings +0.4 to +0.69, variables 13 (mean age of head) and 03 (servants).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 05 (% head's children 15+ working) and 20 (% males gainfully occupied).

Though life cycle elements are dominant there is also a clear link between age and higher social status, areas with an older population having more servants and less adolescent employment. Earlier evidence that male activity rates tended to be low in high status areas is repeated here. Because of its composite nature, Component IV was labelled Life Cycle (Social Status).

GU1851 Component V

Loadings +0.7 or higher, variable 08 (working wives).
Loadings +0.4 to +0.69, variables 26 (manufacturing) and 14 (Wolverhampton born).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 24 (mining) and 04 (young children working).

Component V expresses a contrast between areas dominated by locally born and manufacturing groups (where working wives were common but child

employment rare) and mining areas (where the reverse was the case). This dimension may reflect the fact that much Black Country manufacturing was domestically organized in workshops (e.g. lock, key, chain. bolt and nail making) and that both man and wife participated in the work. It is difficult to explain the absence of child employment in these terms, however, for it does not seem unreasonable to expect children to have helped in the workshop too. The consistent listing of the occupations of wives counts against the idea that such occupations went unrecorded. Women frequently worked in japanning and papier maché factories, but so too did children and this therefore offers no explanation. Certainly, however, child employment was far less important than in mining areas. Clearly Component V suggests life style differences in respect of employment characteristics between locally born and manufacturing populations on the one hand, and mining folk on the other. Hence it was labelled Working Wives and Local Manufacturers.

GU1851 Component VI

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 17 (density) and 04 (% heads' children 5-14 working).
Loadings -0.7 or lower, variable 15 (% heads, non-local English or Welsh).
Loadings -0.4 to -0.69, absent.

This component proved rather difficult to interpret because of the small number of significant loadings, but examination of weaker loadings removed much of the doubt. The polar distinction along Component VI is between areas with relatively high proportions of non-local English or Welsh heads and areas of higher residential densities often dominated by the locally born. In the former areas social class and fertility tended to be higher, whilst in the latter child and adolescent employment, maleness and high male occupancy rates were important as, too, were manufacturing occupations. Component VI was therefore tentatively interpreted as Crowded Workers/Higher Status Non Locals - an unwieldy label expressing some of the complexity involved.

GU1851 Component VII

Loadings +0.7 or higher, variable 09 (% households with high fertility pattern)
Loadings +0.4 to +0.69, absent.
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 11 (% heads with children).

In view of the weakness of most loadings on Component VII, and particularly because two supposed fertility indices loaded in opposite directions it was decided to offer no interpretation. At the very least, the result indicates some doubt regarding the performance of variable 09 which was based on the mean interval between all children present at the date of the census. It is possible to explain the result obtained by suggesting that families exhibiting high fertility tendencies really did live in areas where relatively few household heads had children, but this seems unlikely and it seems safer to question the value of variable 09.

8.13 Dimensions of Residential Differentiation in Wolverhampton 1851: A Review

The most important feature of the results for 1851 is the primacy of a composite axis with social status, occupational and household compositional elements. Quite clearly, the major distinction in 1851 was between high status dealing areas with many non-kin, and low status mining areas with many children. Status, occupation and household composition therefore varied together on the first axis of 1851. The second component distinguished between areas of recent Irish immigration - overcrowded, with an excess of males but few children - and areas dominated by the locally born. Again the dimension is composite, with ethnicity elements complemented by household complexity and family status differences. As the correlation matrix suggested, the Irish immigrant community was of low social status.

The remaining dimensions in 1851 also merit some attention. Component III suggests an embryonic family status axis restricted only to feminist and age elements. Components IV and VI both contain social

status elements, but in the former they are linked with life cycle differences whilst in the latter they are tied to differences between local and migrant non-local groups. Finally, Component V distinguishes between areas dominated by locally born and manufacturing groups, and mining areas; in the former, child employment was less common and working wives more common than in the latter.

As was hypothesized, therefore, a composite social status/family status/occupation dimension was the central feature of residential differentiation in 1851. A newly immigrant community axis was also of some importance. Amongst the remaining components both social and family status elements were well represented but only in a fragmentary way. Indicants of feminism and age were, for example, grouped on a different component from the remaining elements of the theoretical family status axis: household complexity was well represented on Components I and II, while life cycle was represented on Component IV. In 1851 the major dimension of residential differentiation was a composite one including both social status and some family status elements, but the modern family status axis was present only in fragmentary form.

8.2 Wolverhampton 1861

8.21 The Contemporary Background

Wolverhampton's population continued to grow rapidly, reaching 60,858 in 1861 and contemporary evidence presents a clear picture of a former market town gathering to itself the large factories and some of the essential facilities of an important manufacturing centre. Despite heavy immigration between 1851 and 1861, concern about the Irish seems to have abated for little was written about the immigrant problem; this, and other evidence, suggests that Irish immigration was waning by 1861. Public health had improved too as sewers and piped water were extended. There was another cholera epidemic in 1866 but it was less serious than

those of 1849 and 1854 (Registrar General, Report 1868). In 1849 the Wolverhampton District suffered 1365 deaths from cholera and a further 243 from diarrhoea - a death rate from these two causes alone of 13.8/1000 population. In 1854 there were 80 cholera deaths and 312 due to diarrhoea; in 1866 these figures were 8 and 133 respectively. Since the population at risk was increasing continually this represented a great improvement in health, and has been attributed (ibid.) to the fresh water supply carried into South Staffordshire.

Most of the information regarding Wolverhampton around 1861 concerns the town itself, its factories and its labour relations. A useful summary is provided by Kelly's Directory (1860).

> "The town, which is one of the largest of our manufacturing places, is situated on an eminence, in the direct route from London to Holyhead; the North-Western, Oxford, Worcester and Wolverhampton, Great Western, and Shrewsbury and Birmingham railways passing in the immediate vicinity; and in a district abounding with mines of coal, ironstone, and limestone. It consists of streets diverging from the market place (which is an extensive area) to the roads from which they take their names. The houses are in general substantial and well-built. The town is paved, lighted with gas, and partly supplied with water by wells ..... but the supply being quite inadequate to the increasing wants of the town, a company was formed and an Act obtained in 1845 for the erection of waterworks, which were opened in 1847. ..... The soil on the west and north of the town is rich and fertile; but on the south and east there is a continued extent of coal and iron mines, in some places the coal cropping out to the surface ..... The whole of the district to the south and east of the town is worked for coal and ironstone, great quantities of which are supplied to the blast furnaces in the country."

The developing urban services, and the environmental contrast between north-west and south-east are clear. The large cattle and pig markets, the Corn Exchange and the new Market Hall are mentioned at length, indicating the town's continued importance in marketing agricultural products. Old buildings are described too: The Deanery, of substantial fabric with a large croft and garden and erected in the time of the Commonwealth, was occupied as a private residence, while The Old Hall, ancient home of the Levesons was "occupied as a japanware manufactory ..... the property of the Duke of Cleveland".

Despite a massive list of manufacturers of the town, Kelly's Directory does not suggest the numbers employed in individual establishments, though the lingering dichotomy between small and large scale is perceptible. Makers of scale beams, heel tips, sail thimbles, buckles, rack pulleys, tobacco boxes, tin and cut nails, spectacle frames, and woodscrews contrast with "very extensive ironworks, smelting furnaces, and iron and brass foundries. Iron working from the smelting of the iron to the greatest perfection of manufacture, is very extensively carried on in this town" (ibid.). Indeed other evidence shows that the number of blast furnaces in the town was considerable (Jones, J., 1866). The blast furnaces listed for Wolverhampton in 1865 are Chillington (4 built, though 5 are shown to be in blast), Parkfield (5 built and in blast), Priestfield (3 built and in blast), Priestfield New (2 built, none in blast) and "Wolverhampton" (3 built and 2 in blast). Shrubbery is not mentioned.

The trend of increasing industrial disputes and growing class conflict, described earlier, began to gather momentum with a big miners' strike in 1858 (Davis and Hyde, 1970, 66) but the peak did not come until 1865, as Trade Union membership statistics for Wolverhampton show (Figure 8.1). Evidence before the Royal Commission on Trade Unions and Other Associations (1868, 55) includes a description of the Staffordshire Strike of 1863. The iron trade had been very quiet after the depression of 1857, but in 1863 improvement began. The Staffordshire men carefully organized a union and decided to press for higher wages though the official quotation of iron was unchanged and it had previously been customary for wages to rise and fall with the official list prices of iron as fixed at the masters' quarterly meetings. The union planned to avoid a general strike, putting out a few works initially while the other men contributed to the support of the strikers. The masters tried to frustrate this by supplying

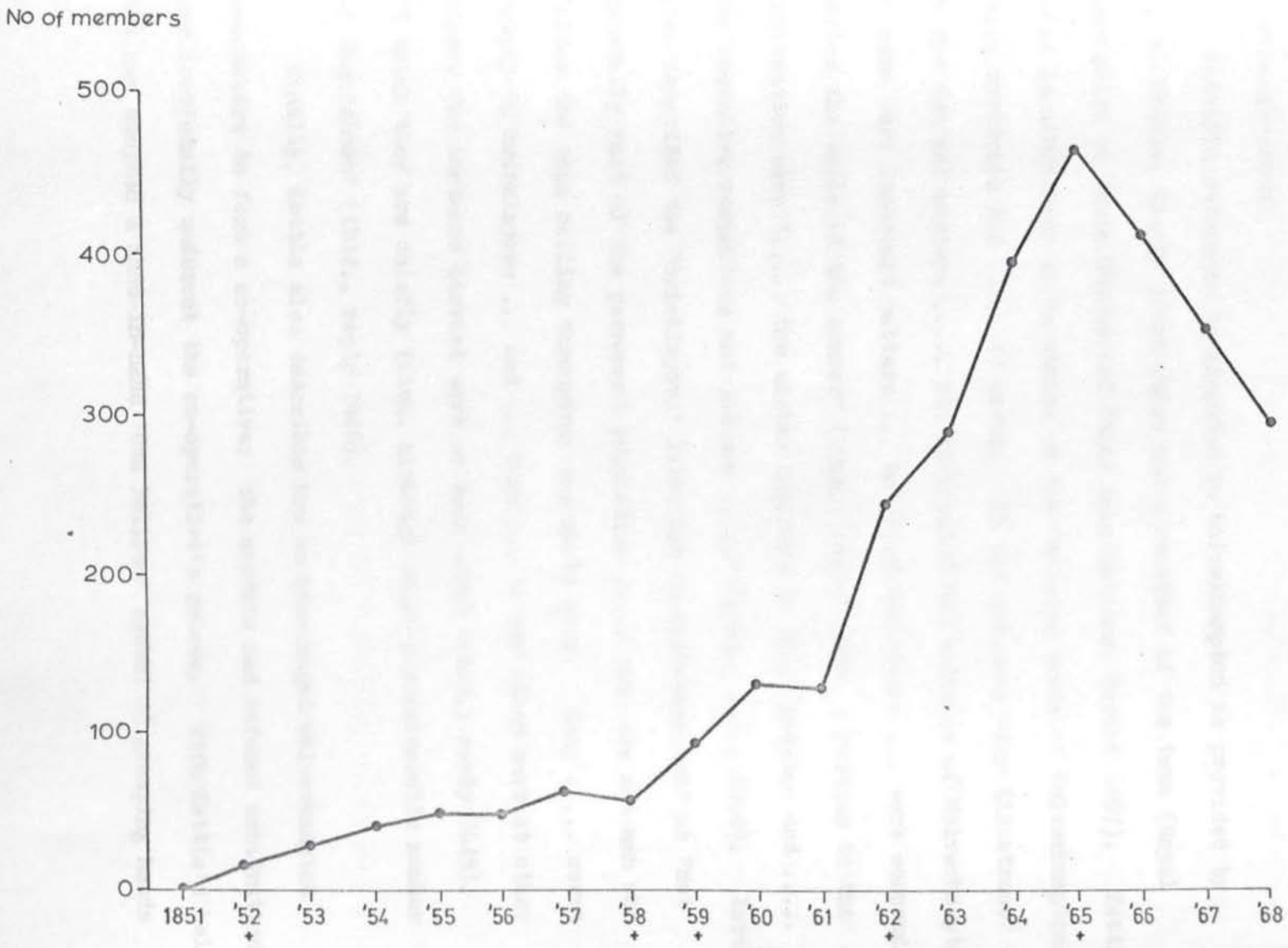


Figure 8.1: Trade Union Membership in Wolverhampton, 1851-68

"puddled bars" to the mills where the men were not working. This lasted 14 weeks but had little effect for a sudden upturn in the trade meant all the works were fully occupied. The ironmasters advanced the price of iron, giving the men the wages demanded three months earlier; things improved so rapidly that another advance followed, and for some time there was a general activity and prosperity of the iron trade. The men attributed their success solely to the union and set about organizing a national union.

Specific reference to disputes in Wolverhampton is provided by Mr. R. Kettle, County Court Judge and a resident of the town (Royal Commission on Trade Unions and Other Associations, Report 1867). Kettle acted as arbitrator in "a strike in the building trade of Wolverhampton which continued for ..... 17 weeks. It was not only very disastrous to the men and masters ..... but it impeded the business of Wolverhampton in some very important matters ... building operations ... were suspended during the whole of the summer" (ibid., reply 6993). Parties to the arbitration were "..... the master builders in Wolverhampton and ..... the operative carpenters and joiners ....." (ibid., reply 6998). Kettle also described the "bricklayers' labourers in Wolverhampton" as "not generally part of the permanent population ..... they are not men who follow the same calling throughout the whole year. Many ..... serve masons or bricklayers ... and ... turn ... to any other work at other times, for instance harvest work or dock work" (ibid., reply 7045). "I think they are chiefly Irish, although there a considerable number of Englishmen" (ibid., reply 7046).

Finally, Kettle also describes how he encouraged Wolverhampton lockmakers to form a co-operative; the masters had refused arbitration and continually undercut the co-operative's prices. With Kettle's help the men adopted a hand-in-hand 'Odd Fellows' symbol of grasping hands

as a trade mark; only top quality locks were to be so designated, and as the reputation of these locks grew the problems posed by undercutting disappeared.

Wolverhampton, therefore, was developing into a manufacturing and industrial town - though the legacy of earlier market functions still lingered. With these changes came a modification of social relations. As large factories were built, attitudes based on the concept of class began to harden and conflict to develop. By 1861, class - and class consciousness - were on the ascendant. The old co-operation between master and men was crumbling. Men were becoming anonymous hands, identification with a craft or trade was waning, and the number of casual labourers obliged to perform general manual tasks was increasing. It is not suggested that changing patterns of residential differentiation caused this change in attitudes, nor is it suggested that changing attitudes led directly to different residential patterns. Rather it is argued that both changing patterns of residential differentiation and changing attitudes were separate manifestations of more fundamental changes in the bases of social differentiation. Movements in attitudes based upon class have already been noted; it remains to examine the trends in residential differentiation as revealed by the component analysis for 1861.

It is against this background that the factorial ecology of Wolverhampton in 1861 must be considered. By comparison with 1851, the population had continued to grow rapidly, large scale factory employment had continued to expand, urban services had begun to improve and class attitudes had started to harden. Movement towards modern urban patterns was therefore underway; it remains to examine the extent to which these changes were revealed in the component structures.

8.22 A Factorial Ecology of Wolverhampton 1861 by Grid Units (GU1861)

Prior to detailed examination of the 1861 component structure it is desirable to examine the correlation matrix from which it was derived (Table 8.3). The pattern of correlations is remarkably similar to that found in 1851 (Table 8.1). If only correlations stronger than ± 0.5 are considered, for example, 30 of the 41 pairs of variables so related in 1851 are similarly linked in 1861. There is, however, a noticeable difference between the two matrices, for in 1861 the general level of correlations is lower. The reason for this is unclear since the sample size was larger in 1861, but detailed investigation suggests that the differences are real ones and are in some way related to the economic down-turn experienced at that time. The variables most affected related to classes IV and V, female employment and headship rates, fertility ratios, age of household heads, those born in Wolverhampton and male occupancy rates. In addition multiple occupancy and dealing have suffered similar declines, but these seem to stem from more permanent changes in residential patterns.

The Components Loading Matrix

Table 8.4 shows the components loading matrix for 1861 by grid units (GU1861) with seven components whose eigenvalues exceeded 1.0 accounting for 79.0% of total variance - a slight fall compared with the more intercorrelated data of GU1851.

GU1861 Component I

Loadings +0.7 or higher, variables 01 (% class I and II), 03 (servants), 25 (dealing), 23 (loners) and 22 (non-kin).
Loadings +0.4 to +0.69, variable 13 (mean age of head).
Loadings -0.7 or lower, variable 10 (fertility ratio).
Loadings -0.4 to -0.69, variables 05 (adolescents working), 11 (heads with children), 24 (% mining) and 25 (sex ratio).

Component I does not appear to be solely a social status dimension for the strong positive loadings indicating high proportions in classes I or II

Table 8.3 Summary Correlation Matrix: GU1861

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
01	1																									
02		1																								
03	+		1																							
04				1																						
05	-		-		1																					
06						1																				
07							1																			
08								1																		
09									1																	
10	-		-							1																
11	-		-							+	1															
12												1														
13										-		+	1													
14														1												
15															1											
16																1										
17																+	1									
18		+														+	+	1								
19	-		-																1							
20																				1						
21																+	+	+			1					
22	+		+							-						+					+	1				
23	+		+							-								-					1			
24	-					-				+													-	1		
25	+		+							-												+	+	-	1		
26			+						-					+												1	

Key:-

1 = 1.0
\+ +0.5
\- -0.5

Table 8.4 Components Loading Matrix: GU1861

GU1861	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	0.89	-0.07	-0.17	-0.14	0.03	0.04	-0.09
02	-0.10	0.66	-0.06	0.29	-0.00	-0.15	0.41
03	0.89	0.05	-0.20	-0.19	0.08	0.01	-0.08
04	-0.17	0.02	0.23	0.78	0.20	-0.15	-0.10
05	-0.67	0.00	0.14	0.13	0.37	0.23	0.27
06	0.21	0.05	0.23	-0.06	0.82	-0.00	0.24
07	0.14	-0.10	0.09	0.30	0.67	0.20	-0.21
08	0.16	-0.10	0.56	-0.46	0.26	0.04	0.20
09	0.21	-0.29	-0.73	-0.08	0.12	-0.03	0.16
10	-0.87	-0.05	-0.02	-0.15	-0.12	-0.18	-0.14
11	-0.62	0.20	0.02	0.06	-0.08	-0.33	0.02
12	0.07	-0.04	-0.01	-0.01	0.04	0.91	0.03
13	0.42	0.03	0.26	0.26	0.07	0.70	0.12
14	0.04	-0.18	0.78	0.13	0.30	-0.01	-0.25
15	0.00	-0.33	-0.17	-0.24	0.00	0.09	0.72
16	0.13	0.78	0.06	-0.05	-0.17	0.08	-0.00
17	0.00	0.82	0.37	0.07	0.09	-0.08	0.00
18	-0.25	0.87	-0.02	-0.03	0.00	0.01	-0.19
19	-0.53	0.25	0.45	0.09	-0.35	0.01	0.16
20	-0.04	-0.17	0.01	0.77	0.00	0.35	-0.07
21	0.10	0.84	-0.14	-0.20	0.03	-0.08	-0.20
22	0.70	0.52	-0.15	-0.18	-0.09	0.09	-0.08
23	0.76	-0.36	0.02	0.02	-0.05	0.06	0.27
24	-0.57	-0.00	-0.22	0.27	-0.30	-0.10	-0.51
25	0.82	0.25	0.05	0.03	0.24	0.04	0.16
26	-0.34	0.02	0.71	0.16	0.26	0.16	0.20
% VARIANCE	26.0	16.2	14.3	7.8	5.9	4.9	3.9

and many servants are not matched by equally strong negative loadings suggesting large proportions in classes IV or V and high rates of employment amongst young children. The distinction at opposite extremes on this dimension is that between dealing areas of relatively high status with more non-kin, and mining areas with a more male sex structure and many children. No longer is the difference merely one of household composition, for the population of areas characterized by dealing occupations tends to be more female and household heads older than in areas where mining is more significant. For this reason the label Dealing Prestige (Family Status) was adopted. Such a label is intended to suggest the continuance of an occupational element, but the decline of an explicit social status contrast: thus dealing was linked with high status but the loadings no longer suggested an unmistakeable link between mining and low status. Further it is suggested that a family status axis had begun to develop once life cycle and sex differences became linked with household compositional contrasts between familist and non-kin types. It may be protested that relatively few of the family status indicants produced significant loadings while most socio-economic variables loaded strongly. The name was chosen, however, to suggest a high status dealing community which differs from mining areas at the opposite extreme largely in terms of family status - the former being older, more female and less fertile than the latter.

GU1861 Component II

Loadings +0.7 or higher, variables 18 (multiple occupancy), 21 (household size), 17 (density) and 16 (Irish).
Loadings +0.4 to +0.69, variables 02 (% class Iv and V) and 22 (non-kin).
Loadings -0.4 or lower, absent but weaker loadings by variables 23 (loners), 15 (non-local English and Welsh) and 09 (interval high fertility measure) merit attention.

Areas loading strongly positively on this component contained relatively large households with many family nuclei, and many non-kin; many heads were Irish born, social class was low and residential density high.

The dimension was therefore centred around ethnicity differences, with a weak loading in the opposite direction from a measure of the non-local English or Welsh population, and a very important overcrowding element too. The twin aspects of overcrowding and ethnicity are dominant, there being little hint of the very excessive maleness and the absence of children which characterize the reception areas for new immigrants. Social class was, however, low emphasizing the failure of Irish immigrants to gain equitable access to the opportunity structures within the town. From the evidence of overcrowding and of low social status it appears that housing and employment were two particular fields in which the Irish were at a disadvantage. Component II was labelled Overcrowding and Ethnicity.

GU1861 Component III

Loadings +0.7 or higher, variables 14 (% Wolverhampton born) and 26 (% manufacturing).
Loadings +0.4 to +0.69, variables 08 (working wives) and 19 (sex ratio).
Loadings -0.7 or lower, variable 09 (interval high fertility measure).
Loadings -0.4 to -0.69, absent but the weaker loading of variable 24 (% mining) demands notice.

This dimension is interpreted as reflecting the distinction between areas with a large Wolverhampton born and manufacturing population, a relatively male sex structure and many working wives, and areas where mining was more significant and fertility was higher (assuming variable 09 may be trusted). Component III was consequently interpreted as Local Manufacturers and Working Wives.

GU1861 Component IV

Loadings +0.7 or higher, variables 04 (working children) and 20 (males gainfully occupied).
Loadings +0.4 to +0.69, absent.
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 08 (working wives).

A clear distinction is apparent between areas where child employment and male occupancy rates were high are those where working wives were

more frequent but child employment and male occupancy rates low. Component IV was therefore labelled Occupied Males and Children.

GU1861 Component V

Loadings +0.7 or higher, variable 06 (% labour force, female).
Loadings +0.4 to +0.69, variable 07 (female heads).
Loadings -0.4 or lower, absent but variables 19 (sex ratio) and 24 (mining) provided weaker loadings.

Component V was labelled Feminism for its positive extreme was found in areas with high levels of female labour-force participation, many female heads and a rather female sex structure. Areas at the negative extreme were characterized by the reverse situation and significant mining employment.

GU1861 Component VI

Loadings +0.7 or higher, variables 12 (% aged 65+) and 13 (mean age of head).
Loadings +0.4 to +0.69, absent.
Loadings -0.4 or lower, absent but the weaker negative loading by variable 11 (% heads with children) is instructive.

Component VI was interpreted as a Life Cycle dimension (Figure 11.7).

GU1861 Component VII

Loadings +0.7 or higher, variable 15 (% heads non-local English and Welsh).
Loadings +0.4 to +0.69, variable 02 (% class IV and V).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 24 (% mining).

This axis is rather paradoxical with the non-local minority group being associated with low social class, while mining and low status loaded in opposite directions. The more usual situation is for an association between non-local heads and high status, and a similar relationship between mining and low social class. The component was not labelled because of this.

8.23 Dimensions of Residential Differentiation in Wolverhampton 1861: A Review

In 1861 the major axis of residential differentiation in Wolverhampton was still a composite one with occupational, status and household compositional

elements. The basic distinction between dealing and mining areas remained but, by comparison with 1851, the importance of a clear status contrast had declined to be replaced by some of the constituents of a family status dimension. In particular, new life cycle, fertility and sex structure differences had begun to emerge. The second axis had also changed significantly. The basis of differentiation remained one of ethnicity and overcrowding but characteristics associated with a newly immigrant community were far less significant. Hence excessive maleness, absence of children and absence of the locally born were no longer so marked in areas with a high proportion of Irish-born heads and serious overcrowding.

The remaining dimensions of residential differentiation were in many ways similar to the minor axes of 1851, though in a different order. Component III (Local Manufacturers and Working Wives), for example, very closely resembles GU1851 Component V; both express a contrast between areas with a high proportion of Wolverhampton born, of working wives and of people in manufacturing occupations on the one hand, and mining areas on the other. Superficially, Component IV (Occupied Males and Children) seems to resemble the social status aspects of GU1851 Component IV but more detailed examination reveals the underlying assoication with GU1851 Component VI (Crowded Workers/Higher Status Non Locals). Component V (Feminism) lacks the life cycle element of Feminism (and Age) (GU1851 Component III), while Component VI (Life Cycle) resembles GU1851 Component IV apart from the loss of social status characteristics. Though many of these changes are probably near-random, resulting from the apportioning of variance between minor components, some of the movement is almost certainly due to changes in the first two dimensions of differentiation. Thus GU1861 Component I has <u>gained</u> life cycle characteristics compared with its counterpart in 1851, whereas Component V (Feminism) <u>lacks</u> just these elements compared with the Feminism (and Age) axis of 1851.

8.3 Wolverhampton 1871

8.31 The Contemporary Background

Population growth continued at a high rate between 1861 and 1871, reaching 68,291 by the later date. Suburban expansion was particularly marked north-west of the town. In this connection it is interesting to note the words of the Report of the Boundary Commissioners for England and Wales (1868, 379) describing the familiar contrast. "The Borough is bounded on the west, north and north-east by agricultural districts; on the south-east and south it adjoins the populous mining and manufacturing district of the Black Country ....." The centre of gravity of Wolverhampton's manufacturing industry lay east, and probably some way south, of the city centre. Hence the number and size of industrial establishments are highly relevant to a description of the east of the urban area. Available data are, unfortunately, scanty on this subject but the number of establishments which came under the Factory Act gives an indication of the number of larger enterprises employing 50 or more (though, unfortunately, brass founding and related trades came within the provisions of the Act irrespective of size, as the Report of the Inspectors of Factories for the half-year ending October 31, 1869 (1870, 274) makes clear for Wolverhampton's case). Table 8.5, taken from that report (ibid., 269) shows there were 144 premises in Wolverhampton township which fell within the provision of the Factory Act in 1869. Though the largest categories were 'miscellaneous metal', 'brass and iron foundries', 'printing shops' and 'iron mills', it is interesting to note four lock and key making factories employed more than 50 hands: small scale workshop production was gradually being replaced, even in lock making.

From 1864 onwards there was an advance in the manufacture of hardware goods in the town and many new trades were introduced, including galvanized

Table 8.5 Factory Employment in Wolverhampton 1869

Under Act of 1864:-	Pipe maker		1
	Maker of ornamental tiles		1
			2
Under Act of 1867:-	Iron mills		7
	Blast furnaces		2
	Manufacturers of machinery		2
	Miscellaneous metal works		66
	Brass and iron foundries		37
	Printing shops		17
	Bookbinding shops		4
Other factories employing 50 hands:-			
	Lock and key making	4	
	Shoe factories	2	
	Varnish making	1	
	Tin toy making	1	
	Artificial manure making	1	
			9
			144

Source: Report of Inspectors of Factories Oct. 1869, 269.
B.P.P. 1870 XV.

goods. Inevitably the new establishments concentrated in the east and south-east of the town, reinforcing the environmental contrast that had long been apparent. Higher status groups, with some choice over residential location, therefore increasingly eschewed this area in favour of the north-west. Further, the growing number of large employers reinforced the trends towards class conflict which had reached an important peak in the construction and iron trade strikes around 1865. But the advance of the hardware and galvanizing trades was not without its critics. Councillor Sidney urged the Council to use its powers under the Health of Towns Act to drive out unhealthy and smoky trades. The debate subsided when the manufacturers got some of their number elected to the Council to put their views, but was reawakened by the 1869 Wolverhampton Improvement Bill. Along with powers over waterworks, sanitation, new building, sewers, the erections of baths, fever hospitals, new streets and finance, this included a clause regulating hardware manufacture. Only when the latter clause had been greatly modified did the Bill become an Act.

Public health improved only slowly. A smallpox epidemic hit the town in autumn 1871, and though it attacked all classes it was worst in the slums - particularly in the east of the town. A description of Wolverhampton's slums is provided by the appendix to the Eighth Report of the Medical Officer to the Privy Council (1866, 192-4). The Common Lodgings Houses Act was used to control overcrowding despite doubts about the legality of inspection. "Wolverhampton without it would be almost intolerable. The plan is to register 60 regular tramp houses, and also 300 cottages of the Irish poor, all of whom ..... receive lodgers. The number is diminishing, the last new entry being dated December 1864, and nearly 200 additional houses having been given up by their licensed owners within the last two or three years." Officers fixed notices of

unfitness on house doors, threatening penalties on letting them; one lot of poor houses in Caribbee Island, so condemned because of their smallness and poor ventilation, was demolished by the owner. Action was taken against cellar bedrooms and bedrooms over privies (as in Gatis Buildings) so that few remained. Houses existed which were built as workshops, but inspection revealed no urgent need for closure or demolition. One house in King Street was declared a nuisance, but action was difficult as it was not inhabited.

The houses which the officers thought the worst in the town were visited, and their descriptions merit attention.

> "In Golden Cup Yard was the worst case, houses of two storeys standing in an alley 3 to 4 feet wide, the rents about 2s or 2s 6d."

This is a clear example of the building up of a yard - in this case that of a public house.

> "In Pountney's Fold the alley was 8 feet wide, the houses on one side were three storeys, on the other two. The ground floor of one was ..... 11 feet by 9 feet 8, by 8 feet high. The smaller houses were let at about 2s 4d, the larger, having three bedrooms, were 3s. ..... About 2 feet from the well was a ruinous drain whose contents had freely mixed with the well water. ..... Lowe's houses, consisting of a kitchen and bedroom 11 feet by 8, 6 feet 6 high were let at 2s 2d."

> "The courts in Piper's Row are very insalubrious. In court 7, the houses are about 15 feet high and are of two storeys, a kitchen and bedroom. The alley is only 3 feet 7 inches wide, with a high wall all round, a privy occupying the bottom, and admittance being gained to the court by an entry through a house. In one alley, 2 feet 7 inches wide, a bedroom over a privy and receptacle has been turned into a workshop. Rents seemed usually high. In Cole's Croft, cots of a kitchen and bedroom ..... brought 2s a week ... but ... rents were not usually paid with regularity."

> "In Cole's Croft and in Caribbee Island are many of the Irish cottages ..... on the register of common lodgings ..... (and many) single bedroomed houses, which measure only 9 feet by 9, and are let at 1s 6d, or if with 2 bedrooms at 2s; many of them were in a very bad state of repair. ..... Here the board had induced the destruction of seven houses, and others had fallen down, to the manifest improvement of the condition of the rest."

Such were the shocking housing conditions for the poor in Wolverhampton, even at the end of the study period; the eastern and south-eastern location

of most of the problem areas need not be restated. The Irish ghetto remained, suggesting that assimilation was far more gradual than was anticipated in Chapter 2. This is partly due to the fact that early immigrants were replaced by new arrivals as the town formed a stepping stone in the migration process. It is therefore significant that the number of registered Irish lodging cottages had, at last, begun to diminish noticeably; integration was unlikely whilst the Irish continued to provide and to occupy lodgings for transients. The mobile migrant was only one element in the ghetto; detailed analysis of fertility and birthplace data reveals a stable Irish population group resident in the town. Since, by 1871, accommodation of transients seems to have declined, the precise character of the ethnicity dimension at that date is of considerable interest.

8.32 A Factorial Ecology of Wolverhampton 1871 by Grid Units (GU1871)

The correlation matrix upon which the component structure was based is summarized in Table 8.6. Again the pattern strongly resembles those described earlier: of the 49 pairs of variables linked by correlations stronger than ± 0.5, 19 were present in both GU1851 and GU1861, whilst 28 were present in either one or other of these earlier analyses. By comparison with 1861 the level of intercorrelation is higher, though still not as high as in 1851; several of the variables which were much more weakly correlated with others in 1861 than had been the case in 1851 have regained former links. This is particularly true of variables 02 (% class IV or V), 06 (% labour force, female), 07 (female heads) and 14 (Wolverhampton born). If the level of intercorrelations are examined carefully over the three censuses two further groups of variables may usefully be recognized. Firstly there are those variables which have lost a large proportion of their strong relationships with other variables. Examination of this category is instructive for it contains very many of

Table 8.6 Summary Correlation Matrix: GU1871

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
01	1																									
02	-	1																								
03	+		1																							
04				1																						
05	-		-		1																					
06						1																				
07						+	1																			
08						+		1																		
09									1																	
10	-									1																
11	-		-				-			+	1															
12							+			-	-	1														
13												+	1													
14					+	+								1												
15			+					-							1											
16		+														1										
17		+													-	+	1									
18		+															+	1								
19	-				+														1							
20																				1						
21																		+			1					
22	+		+		-					-												1				
23	+		+															-					1			
24																								1		
25	+		+							-	-	+										+			1	
26	+	+		+	+									+	-				+							1

Key:-

1 = 1.0
\+ +0.5
\- -0.5

the characteristics of the newly immigrant community - variables 13 (age of head), 16 (Irish), 18 (multiple occupancy), 20 (males gainfully employed), 21 (household size) and 23 (loners). In addition variables 3 (servants) and 24 (mining) followed a similar pattern. Secondly there is a group of variables which increased their share of strong correlations significantly over the period: variables 01 (% class I or II), 05 (adolescents working), 11 (heads with children), 12 (% aged 65+), 17 (density) and 26 (manufacturing). Variables 01 and 05 both measure status whilst variables 11 and 12 reflect family status, but the increased level of correlation seems to result largely from the improved articulation of the latter: certainly social status variables exhibited increased correlation with family status indicants as the higher status familists increasingly moved into the north-western suburbs.

The Components Loading Matrix

Seven components with eigenvalues greater than 1.0 were extracted; together they accounted for 80.3% of total variance (cf. 81.4% in GU1851 and 79.0% in GU1861) and are shown in Table 8.7.

GU1871 Component I

Loadings +0.7 or higher, variables 12 (% aged 65+) and 07 (female heads).
Loadings +0.4 to +0.69, variables 13 (mean age of head), 25 (dealing), 23 (loners) and 03 (servants).
Loadings -0.7 or lower, variable 11 (heads with children).
Loadings -0.4 to -0.69, variable 10 (fertility ratio).

Areas scoring strongly positively on this dimension had relatively old populations, many female heads and significant dealing employment. Servants and loners were common, and weaker loadings suggest rather large households and those including non-kin were important. By contrast, areas at the negative extreme on Component I had simpler household patterns with fewer non-kin and more including children. Polar differences in household composition are clear: at the positive extreme non-familist complex types including non-kin abounded, while at the negative extreme

Table 8.7 Components Loading Matrix: GU1871

GU1871	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	0.30	-0.39	-0.67	0.01	0.37	0.10	0.11
02	-0.05	0.68	0.51	0.24	-0.00	-0.20	0.07
03	0.42	-0.20	-0.35	-0.30	0.55	-0.09	0.34
04	0.16	0.06	0.65	0.37	-0.08	0.13	0.01
05	-0.23	-0.00	0.54	0.26	-0.50	0.14	-0.05
06	0.33	0.06	-0.03	0.82	-0.02	-0.08	0.01
07	0.78	0.10	-0.28	0.26	-0.10	-0.16	-0.04
08	-0.09	-0.04	0.04	0.82	0.10	0.12	0.09
09	-0.00	-0.15	0.05	-0.00	0.09	-0.00	-0.90
10	-0.59	-0.04	0.48	-0.04	-0.06	-0.44	-0.13
11	-.076	0.05	0.10	0.00	-0.31	-0.28	-0.18
12	0.84	-0.15	-0.03	0.11	-0.03	0.14	-0.03
13	0.66	0.18	0.37	-0.02	0.16	0.00	-0.12
14	0.13	0.13	0.40	0.62	-0.28	-0.22	-0.22
15	-0.03	-0.26	-0.23	-0.65	0.39	0.17	0.15
16	0.24	0.78	0.12	-0.11	-0.01	0.00	0.03
17	0.05	0.75	0.13	0.49	-0.01	0.17	0.08
18	0.00	0.78	0.04	0.26	-0.09	0.41	0.18
19	-0.13	0.08	0.86	-0.22	-0.12	0.12	0.09
20	0.21	0.30	0.19	-0.09	0.04	0.79	-0.01
21	0.39	0.76	-0.26	-0.18	-0.00	0.08	-0.00
22	0.33	0.21	-0.68	-0.09	0.12	0.28	0.34
23	0.48	-0.51	-0.09	-0.17	0.41	0.23	0.10
24	-0.01	0.00	0.17	0.00	-0.86	-0.07	0.24
25	0.53	0.00	-0.35	0.16	0.49	0.29	0.34
26	0.06	0.12	0.72	0.41	-0.17	0.11	-0.11
% VARIANCE	28.3	18.5	12.3	8.0	4.8	4.4	4.0

familist households with children were more characteristic. Age contrasts were also significant, the population in the former areas being older than that in the latter. Both these differences were, however, associated with the presence or absence of a relatively high proportion in dealing occupations. The association between numerous servants and dealing employment remained, but was no longer clearly linked with large proportions in classes I and II - confirming the view that many "servants" may have been kept for business rather than household duties. The dominant character of Component I is not that of a social status axis but of a family status dimension, with five of the eight family status indicants loading stronger than ± 0.4. Indeed, if the argument that many servants must have been engaged in business duties is accepted, there is little reason to speak of "dealing prestige". Component I was therefore labelled Family Status (Dealing).

GU1871 Component II

Loadings +0.7 or higher, variables 18 (multiple occupancy), 16 (Irish), 21 (household size) and 17 (density).
Loadings +0.4 to +0.69, variable 02 (% class IV and V).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 23 (loners).

Overcrowding and ethnicity differences underlie Component II. Large households, multiple occupancy and high densities characterized areas with many Irish born heads. A weaker negative loading by variable 15 (non-local English or Welsh) confirms the birthplace contrast, while the prominence of loners in non-Irish areas only reinforces the degree of multiple occupancy in the high density districts where the Irish lived. There were no marked contrasts in sex ratios, fertility or age so the characteristics of the new immigrant community were lacking. One particular feature merits attention: not only was a high proportion of Irish born heads associated with a high proportion in classes IV and V (possibly suggesting the continued disadvantage of immigrants in employment) but

there was also a loading on this Component of -0.39 by variable 01 (% class I or II). This may be taken to suggest that the ethnicity dimension was beginning to move towards a more general socio-economic status axis. Obviously the process had not progressed very far, but assimilation of the Irish to the lower status population may have been underway. For this reason Component II was labelled Overcrowding and Ethnicity (Low Status).

GU1871 Component III

Loadings +0.7 or higher, variables 19 (sex ratio) and 26 (manufacturing).
Loadings +0.4 to +0.69, variables 04 (child employment), 05 (adolescent employment), 02 (% class IV or V), 10 (fertility ratio) and 14 (Wolverhampton born).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 22 (non-kin) and 01 (% class I and II).

The social status aspects of Component III are striking, with four of the five indicants of socio-economic status providing loadings stronger than $\pm$ 0.5 and the remaining one (variable 03, domestic servants per household) a value of -0.35. Maleness of sex structures, high fertility ratios, manufacturing employment and birth in Wolverhampton characterized low status areas, while households containing non-kin were more common in high status areas with large negative scores on this axis. Though the social status elements are dominant, therefore, there is nevertheless a slight family status-type contrast in household composition between low status areas with simple familist patterns and high status areas with lower fertility ratios and more non-kin. Component III was labelled (Low) Social Status (Local Manufacturers and Fertility) in an attempt to reflect this.

GU1871 Component IV

Loadings +0.7 or higher, variables 08 (working wives) and 06 (% labour force, female).
Loadings +0.4 to +0.69, variables 14 (Wolverhampton born), 17 (density) and 26 (manufacturing).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 15 (non-local English and Welsh).

Component IV was interpreted as Feminism (Local Manufacturers).

GU1871 Component V

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 03 (servants), 25 (dealing) and 23 (loners).
Loadings -0.7 or lower, variable 24 (mining).
Loadings -0.4 to -0.69, variable 05 (adolescents working).

The simplest distinction on Component V is between areas where dealing employment was important and those where mining was more significant. The former tended to be characterized by many servants who were (almost certainly) loners too, while the latter had high levels of adolescent employment. Though the finer points of the axis may be understated thereby, the label Occupation (Dealing/Mining) was adopted.

GU1871 Component VI

Loadings +0.7 or higher, variable 20 (% males gainfully occupied).
Loadings +0.4 to +0.69, variable 18 (family nuclei per 100 households).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 10 (fertility ratio).

Areas scoring strongly positively had high male occupancy rates and high levels of multiple occupancy, whereas areas scoring strongly negatively had lower male occupancy rates, lower levels of multiple occupancy and higher fertility ratios, suggesting that the dominant feature of Component VI is the implied differences (at either extreme) in household composition. The label Household Composition (Occupied Males) was considered appropriate.

GU1871 Component VII

Loadings +0.7 or higher, variable 09 (interval fertility measure).
Loadings +0.4 to +0.69, absent.
Loadings -0.4 or lower, absent.

In view of the unreliability, in many cases, of variable 09 and because of the weakness of most loadings no interpretation was proposed for this component.

8.33 Dimensions of Residential Differentiation in Wolverhampton 1871: A Review

By 1871 the major dimension of residential differentiation was far closer to the modern family status axis than to the composite status/household composition dimension of 1851. Ethnicity and overcrowding formed

the second dimension in 1871, and though social status differences were apparent along this axis it is clear that Component III was the main socio-economic status axis. The latter was not, however, completely divorced from family status-type contrasts and therefore it is not possible to see the results of the GU1871 analysis as three distinct and completely independent axes. Nevertheless, compared with 1851 the degree of movement towards the idealized three dimension model of Shevky and Bell is remarkable.

In addition to the three major Components, the minor axes also offer interesting results. Component IV continues to express the characteristic life-style of a Wolverhampton born and manufacturing population amongst whom female employment was important. It is possible that this dimension is relatively free from low status characteristics because of the peculiar occupational mix of Black Country manufacturing areas: these contained many skilled workers whose Social Class - as given by the Registrar General - belies their vulnerability to cyclic trade patterns and to exploitation by factors and dealers. Component V also expresses a consistent theme of the three analyses - the presence of an occupational axis representing the contrast between dealing and mining areas.

8.4 Summary: The Ecology Of Social Change 1851-1871

Only by detailed comparison of component structures for 1851, 1861 and 1871 is it possible to assess the value of the hypotheses advanced in Chapter 2. In performing such comparison, detailed examination of individual loadings may be supplemented by a more objective use of congruence coefficients described in Chapter 7. These are presented in Tables 8.8, 8.9 and 8.10.

Table 8.8 shows the congruence coefficients between the structures for 1851 and 1861. Despite the differences in detailed interpretation, the first component of GU1861, Dealing Prestige (Family Status) is seen

Table 8.8 Congruence Coefficients GU1851/GU1861

		COMPONENTS GU1861						
		I	II	III	IV	V	VI	VII
COMPONENTS GU1851	I	0.9446	-0.1362	0.0580	-0.0772	0.0275	-0.2794	-0.0316
	II	0.1531	0.9726	-0.0104	-0.0127	-0.1417	0.0196	0.0994
	III	0.1677	0.0651	-0.0195	0.3111	0.7714	0.5052	0.1419
	IV	0.1609	-0.0388	-0.0572	-0.5025	-0.2241	0.7128	-0.3981
	V	-0.0628	-0.0102	0.8370	-0.3882	0.0976	0.0418	0.3653
	VI	0.0654	-0.0001	0.5197	0.6594	-0.2979	0.1647	-0.4181
	VII	0.1484	-0.1722	-0.1490	0.2429	-0.4854	0.3596	0.7087

Table 8.9 Congruence Coefficients GU1861/GU1871

		COMPONENTS GU1871						
		I	II	III	IV	V	VI	VII
COMPONENTS GU1861	I	0.4725	-0.1620	-0.5372	0.0445	0.4907	0.2809	0.3748
	II	0.1054	0.9821	-0.0430	0.0110	0.0411	0.0592	0.1309
	III	0.0837	-0.0649	0.5217	0.5747	0.0526	-0.1607	0.5980
	IV	0.0982	-0.0335	0.3120	0.0402	-0.2409	0.9104	-0.0617
	V	0.2455	0.0396	-0.1782	0.7409	-0.0075	-0.0386	-0.5966
	VI	0.8087	-0.0259	0.3751	-0.3341	-0.0757	-0.2341	-0.1791
	VII	-0.1852	0.0394	0.4093	-0.0754	0.8312	0.0837	-0.3051

to be very similar to its 1851 counterpart Social Status (Occupation, Household Composition). It is tempting to argue that this illustrates the inability of Veldman's technique to distinguish significant variation. To adopt such a stance is, however, to dismiss the results purely because they do not support the hypotheses developed in Chapter 2. If congruence analysis is to form part of a hypothesis testing methodology it must be permitted to refute hypotheses where they are inadequate. Hence it must be conceded that Component I in 1861 may not be as different from Component I of 1851 as has been suggested. In view of the general stability of the ethnicity dimension, the similarity of the second Components in the two analyses is, perhaps, less surprising - though the loss of traits indicating recent immigration might have been expected to be more apparent. The similarity between the Feminism axis (GU1861 Component V) and Feminism (and Age) (GU1851 Component III) is comforting in view of their interpretations, whilst the importance of the age element in 1851 is confirmed by the clear link with the Life Cycle dimension in 1861 (Component VI).

Table 8.9 shows a similar comparison, but between GU1861 and GU1871, and substantial differences emerge. GU1871 Component I, Family Status (Dealing), does not greatly resemble the first Component of 1861, Dealing Prestige (Family Status), though a mild similarity persists. Of all the 1861 Components, the resemblance to Life Cycle (VI) is greatest, though the presence of elements of Feminism (V) is admitted. Even more telling is an examination of the 1871 Components which resemble GU1861 Component I most closely. No component achieves a high degree of congruence; several are mildly related - particularly a reflection of (Low) Social Status (Local Manufacturers and Fertility), Occupation (Dealing/Mining) and Family Status (Dealing). It might be argued that this exposes the limited value of the labels for the first Component in each analysis.

Admittedly Social Status (Occupation, Household Composition) for 1851, Dealing Prestige (Family Status) for 1861 and Family Status (Dealing Prestige) for 1871 might be taken to imply a greater similarity between 1861 and 1871 than between 1851 and 1861. This was not intended however and the chosen labels carefully emphasize common social status elements in 1851 and 1861 which were less prominent in 1871. Whatever the merits of the names selected, important changes are obvious: the first Component of 1861 combines social status, occupational and some family status elements, while that of 1871 is predominantly a family status axis with far fewer social status connotations.

Again there is a marked correspondence between the ethnicity-overcrowding dimensions in the two analyses, but considerable variation with respect to axes with social status aspects such as GU1861 Component III, Local Manufacturers and Working Wives; GU1871 Component III, (Low) Social Status (Local Manufacturers and Fertility); and GU1871 Component IV, Feminism (Local Manufacturers). It seems probable that one reason for this is the relative absence of status elements in the first component of 1871 compared with that of 1861.

Finally, Table 8.10 presents the congruence coefficients derived from a comparison of GU1851 and GU1871, and immediately confirms and clarifies the changes seen in Table 8.9. The correspondence between Social Status (Occupation, Household Composition), the first axis in 1851, and Family Status (Dealing) of 1871, is small. The dimension most like GU1851 Component I is Occupation (Dealing/Mining), though other congruence coefficients affirm the socio-economic and household structure aspects too. By contrast, GU1871 Component I resembles Feminism (and Age), Life Cycle (Social Status), Crowded Workers/Higher Status Non-Locals, and Social Status (Occupation, Household Composition) axes of 1851; though social status elements persist the dominance of the multi-faceted family status characteristics is unmistakeable.

Table 8.10 Congruence Coefficients GU1851/GU1871

		COMPONENTS GU1871						
		I	II	III	IV	V	VI	VII
COMPONENTS GU1851	I	0.3273	-0.2959	-0.3306	-0.0432	0.6681	0.1449	0.4762
	II	0.1803	0.9144	-0.0202	-0.0966	0.1516	0.2899	0.1206
	III	0.5983	-0.0714	-0.2922	0.5512	-0.3710	0.2826	-0.1741
	IV	0.4919	0.1382	-0.1315	-0.2111	0.1156	-0.7598	-0.2935
	V	-0.2335	0.1383	0.1774	0.7453	0.5039	-0.2074	-0.2068
	VI	0.4121	-0.0714	0.8207	0.0798	-0.0714	-0.0636	0.3690
	VII	0.1899	-0.1671	0.2873	-0.2802	0.3476	0.4367	-0.6806

There can be little doubt, too, about the stability of the ethnicity and overcrowding dimension between 1851 and 1871 though, in view of the loss of newly immigrant community characteristics, the reduction in congruence coefficients is appropriate. Clearly the hypotheses developed earlier were wide of the mark in predicting a decline in the importance of ethnicity as immigrant assimilation proceded. It is instructive to notice the resemblance of GU1871 Component III, (Low) Social Status (Local Manufacturers and Fertility), to a lowlier axis in 1851 - Crowded Workers/ Higher Status Non-Locals (VI). The implication is that, even in 1851, when social and family status elements clustered together on the first dimension of differentiation, there were the seeds of a separate socio-economic status axis. Conversely, even by 1871, when this separate social status axis had become more prominent, there were still social rank characteristics linked with the family status axis.

The nature of the changes in the dimensions of residential differentiation between 1851 and 1871 is not, however, easily grasped from component loading matrices or from congruence coefficients. Perhaps the most striking method of presenting these changes is by directly comparing prominent loadings upon comparable components in 1851, 1861 and 1871. The present Chapter therefore concludes with such a comparison, as an effective means of presenting the important changes in a way that allows the original hypotheses to be critically examined.

8.41 The First Dimension of Residential Differentiation 1851 to 1871

An examination of the three component loading matrices (Tables 8.2, 8.4 and 8.7) shows that, though the first dimension of residential differentiation underwent considerable changes between 1851 and 1871, there were several constant elements. Throughout the three analyses high proportions in dealing occupations loaded positively on the first Component as, too, did number of servants and number of loners. Associated with this pattern

was a consistent negative loading by fertility ratio suggesting an under-representation of young children relative to the numbers of women aged 15-44. Together, these loadings suggest a contrast between the city centre and the outer districts of the town. The centre was characterized by a concentration of dealing employment, and this was associated with the maintenance of servants for commercial duties as well as for normal domestic tasks. A large proportion of servants was unmarried, producing the high level of loners in the dealing district. Similarly, many servants were female and hence fertility ratios were artificially depressed by their numbers. Fertility ratios were also low because, even in 1851, a relatively low proportion of household heads in the dealing centre had children (variable 11 loading negatively throughout).

The loadings of the remaining variables changed significantly. In 1851, areas with high proportions in dealing occupations had high proportions in classes I and II, whereas areas with low levels of dealing employment had high proportions in classes IV and V, high levels of child employment and significant numbers in mining occupations. The basis of the contrast in 1851, therefore, was not merely occupational. There were very significant status and household compositional differences along the main dimension of residential differentiation. Indeed, four of the five social status indicants loaded significantly on the first Component of 1851: dealing areas were associated with high proportions in classes I and II, low proportions in classes IV and V, large numbers of servants and small numbers of children aged 5-14 who were working. By 1861 the social status dichotomy was less clear, there being no strong negative loading by the proportion in classes IV and V or by child employment. Three of the five indicants of socio-economic status still loaded significantly, however, so that the status difference had not entirely disappeared. There were other important differences which suggested the direction in which

residential differentiation was moving. By comparison with 1851, variable 23 (non-kin) loaded more strongly positively in 1861 - suggesting an intensification of differences in household composition. "Normal" families containing children were perhaps moving out of the central area. Certainly life cycle differences began to be apparent (variable 13) with household heads in dealing areas tending to be rather older.

By 1871 both life cycle variables (12 and 13) were positively linked with dealing occupations on Component I: age differences were intensifying. Not only was the population of the centre becoming differentiated in terms of the age of heads and the proportions over 65, but an increasing proportion of heads were female. At the end of the study period, therefore, dealing areas were characterized as having an older population, more female heads, more loners and fewer children than areas scoring strongly negatively on the first Component. In fact ignoring the unreliable variable 09, five of the seven family status indicants provide loadings stronger than ± 0.4. Moreover social status differences seem to have evaporated. Areas of dealing employment were no longer characterized by their high status population, the absence of those in classes IV and V and the scarcity of child employment.

The composite primary dimension of 1851, embracing status, occupational and compositional differences had been replaced by a dominantly family status-type axis in 1871. The label Social Status (Occupation, Household Composition) for 1851 is superceded by Family Status (Dealing) for 1871 to caricature this movement. Component I alone therefore provides overwhelming evidence for the temporal evolution of dimensions of residential differentiation during rapid urbanization and population growth. Table 8.10 confirms the extent of the changes that had taken place.

8.42 The Second Dimension of Residential Differentiation 1851 to 1871

Equally strong evidence for the central hypothesis of temporal evolution in the dimensions of residential differentiation is furnished by a consideration of changes in the ethnicity/overcrowding axis between 1851 and 1871. Most of the loadings on the second axis of residential differentiation were constant throughout the period. The most obvious block of variables suggests overcrowding: multiple occupancy, large households and high residential densities all load strongly positively. Overcrowding is consistently linked with a high proportion of Irish born heads and a high proportion in classes IV and V. By contrast a low proportion of non-kin were loners. This may seem paradoxical, but is a true representation of the Irish ghetto areas where, although there were very many loners per head of population, loners were swamped as a proportion of non-kin by the extremely large numbers of family nuclei. Multiple occupancy was so important that, though many household members were not related to the household head, relatively few had no relative in the same household.

Several variables loaded along with overcrowding/ethnicity elements in 1851 though they had disappeared by 1871. The most important of these portray the ghetto of 1851 as lacking children, women and those born in Wolverhampton. These elements identify a newly immigrant community. The initial impetus of immigration was provided by males in the 20-45 age group and, although many couples undoubtedly moved in after their marriage, there was a surplus of single men. Children, women and the Wolverhampton born were not conspicuously absent by 1861 and certainly not by 1871. The lack of the Wolverhampton born, it might be noted, would be corrected when Irish parents began to have children born in the town. By 1871 loadings, other than the hard core of overcrowding/ethnicity variables, were very largely absent. One interesting feature,

however, was the loading of -0.39 by variable 01 (class I and II) so that the two key social status indicants loaded in opposite directions on the overcrowding/ethnicity axis. It may tentatively be suggested that this indicates a movement of the dimension towards a more general social status axis. Even if this possibility is discounted, however, the loss of the characteristics of the newly immigrant community are sufficient to indicate a temporal evolution in the dimension of residential differentiation. Table 8.10 documents the degree of these detailed changes, suggesting the overall similarity of the Newly Immigrant Community Component of 1851 and the Overcrowding and Ethnicity (Low Status) Component of 1871.

8.43 Remaining Dimensions of Residential Differentiation 1851 to 1871

One of the most noteworthy features of the minor dimensions is the movement towards a significant social status axis as Component I sheds its status elements. Component VI in 1851 was interpreted as Crowded Workers/Higher Status Non-Locals but, apart from child employment, lacked strong loadings from social status indicants. By 1871, Component III embraced significant loadings from four of the five social status indicants, yet retained the distinction between Wolverhampton-born and manufacturing populations on the one hand and non-locals on the other. Table 8.10 reveals the similarity between the two axes; it is also clear that the next most similar Component was the first Component of 1851 with its clear social status elements. The emerging social status axis of 1871 was labelled (Low) Social Status (Local Manufacturers and Fertility).

Finally, it is necessary to recognize elements of constancy in the patterns of residential differentiation. Table 8.10 shows the similarity between the fifth Component of 1851 - Working Wives and Local Manufacturers - and the fourth of 1871 - Feminism (Local Manufacturers). Throughout the whole of the period one Component isolated areas with locally born populations, many in manufacturing jobs and very high levels of female

employment. But despite such constancy the major theme during an era of rapid urbanization was of change in the dimensions of residential differentiation.

8.5 Conclusion

Between 1841 and 1871 Wolverhampton underwent industrialization and urban growth which led to major socio-economic changes. The population rose rapidly and factories increased in number and size, attracting a large labour force. Public transport was lacking, so the increased population was accommodated in new, poor quality housing built on former yards and gardens ("infilling") or by multiple occupancy. The deleterious effect upon the residential environment and the increased commercial land values which this population influx occasioned, encouraged high status business families - formerly resident in the city centre - to move to suburban homes.

In 1841 the town retained many pre-industrial characteristics (see Chapter 3), though the introduction of large scale factory employment had begun in certain industries during the 1820s. Large scale and factory employment increased in importance and spread to other trades during the period 1851 to 1871 and this process seems to have been associated with the emergence of class consciousness. Conflict between the classes culminated in a series of strikes around 1865. But industrial strife was not the only upheaval during the industrializing phase in Wolverhampton's history. Shortly before the 1851 census there was a major influx of Irish immigrants; many had been driven from their homeland by the Potato Famine and were forced to occupy the worst and most overcrowded slum property. By 1871, however, an equilibrium was beginning to establish itself; the numbers of Irish in the town had declined since 1861 and the transient Irish population was waning. In addition, it seems that many of the higher status Irish migrants has also left

Wolverhampton by that date - possibly because the town was only a stepping stone in a migration to London or perhaps even America.

There is considerable evidence of the development of urban facilities (the waterworks and piped water, new sewers, the new Market Hall, etc.) and of moves towards greater control over the urban environment (e.g. the 1869 Wolverhampton Improvement Bill described in Section 8.31).

Between 1851 and 1871, therefore, Wolverhampton moved away from the pre-industrial and towards the modern city with factory employment, substantial urban facilities and powerful institutions to control and direct change. During the phase of rapid industrialization there were major social upheavals, including a surge of immigration from the surrounding counties and from Ireland, and an outburst of class conflict. Paralleling these changes were movements in residential structure.

Within a relatively short period, patterns of residential differentiation were transformed. The situation in 1851 resembled the pre-industrial ideal, with socio-economic status and household complexity indicants loading strongly on the same major dimension of residential differentiation. By 1871 the pattern was much closer to the modern city type, with socio-economic status and family status as relatively independent dimensions of residential differentiation. Change affected ethnicity too. Whereas, in 1851, the ethnicity/overcrowding axis was associated with many of the features of a newly immigrant community (male sex structure, high male activity rates, few old people, few children and few locally born) by 1871 these traits had disappeared and the number of common lodging houses had fallen. Partly as a result of the departure of some of the higher status residents, the ethnicity dimension had moved closer towards a more general social status axis; areas containing high proportions of Irish heads tended - to a greater extent than before - to be of low social status.

One problem must be acknowledged. Difficulty was experienced in integrating the two main strands of the argument - namely the background historical material and the factorial ecologies. There are several reasons for this (see Section 11.2). The changes under consideration are of very different types: whilst the contemporary conditions discussed are relatively general, the dimensions of residential differentiation are very specific manifestations of particular urban trends. Data are derived from totally different sources and presented in contrasted ways, making integration even more difficult. In particular, factorial ecology seems to provide a language of its own which is lucid in its own domain but which is not easily extended further. Perhaps the major cause of difficulty, however, is the absence of any comprehensive and explicit statement of the inter-relationships between different aspects of change during urbanization. For this reason the present analysis juxtaposes two types of material in the conviction that both reveal evolutionary trends towards more modern patterns even if the precise links between the two sets of changes is, as yet, only imperfectly understood. What is important is that change was underway and was in one direction - towards modern urban patterns and institutions.

CHAPTER 9 THE STABILITY OF THE CONCLUSION WITH RESPECT TO DIFFERENT APPROACHES

It was demonstrated in Chapter 8 that a temporal evolution in the dimensions of residential differentiation characterized Wolverhampton's period of rapid urbanization and growth - as hypothesized in Chapter 2. The data used were aggregated to grid units which remained constant for all three censuses. Principal components analysis, followed by varimax rotation, was applied to normalized data weighted according to population size. A particular data set was therefore analyzed in a particular way and certain conclusions were drawn from the results. It is important to know whether alternative data sets based on the same information, and/or alternative analytical procedures would have furnished consistent or conflicting conclusions. For convenience, two related issues may be separated. The question of the generality of conclusions with respect to different scales of analysis is of great theoretical concern. In towns like nineteenth century Wolverhampton with little public transport and with spatially distinct foci for different types of employment (retailing, transport, mining etc.) residential areas may have varied with respect to social status at a much smaller scale than with respect to occupation. Hence it is possible that different axes of differentiation operated at different scales and so would be revealed by different scales of analysis. A more practical question concerns the stability of conclusions with respect to different areal units, methods of analysis and overall approach. Great effort was required to express census data by grid units constant for all dates. It is natural to ask whether this effort was worthwhile or whether analysis of shifting EDs would have yielded similar conclusions. The present Chapter therefore examines the stability of earlier conclusions with respect to different approaches.

9.1 The Generality Of Conclusions With Respect To Scale: Analyses Of Ward Data

The correlation matrices, upon which the factorial ecologies of Wolverhampton by ward (WA1851, WA1861 and WA1871) were based, depended on only nine areal units and, though this does not invalidate the conclusions, it shows the folly of argument from ecological to supposed individual correlations. A strong correlation between the proportion Irish born and household size does not mean that the Irish necessarily lived in large households. They may have done so, but a purely coincidental association (with most of the Irish living in the same ward(s) as most of the large English households) is equally possible. One feature of ward data which merits attention, however, is the large sample and consequent low sampling error. This probably explains the greater inter-correlation of many variables at ward level than at grid unit level. But, as Robinson (1950) shows, correlations tend to rise with the size of the areal units used. These two effects are combined in the dramatic increase in the strength of inter-correlation from grid to ward level. The central question is whether dimensions of residential differentiation differed markedly at the greater level of aggregation.

9.11 A Factorial Ecology of Wolverhampton 1851 by Wards (WA1851)

The greater degree of inter-correlation in the ward data tended to shift the focus away from social class variables slightly, so that variables 13 (mean age of head) and 12 (% aged 65+) had the largest number of correlations stronger than ± 0.5. Table A1.1 in Appendix 1 presents the components loading matrix for WA1851. Seven components accounted for nearly 100% of total variance and, though only five had eigenvalues greater than unity, it was decided to retain them all for rotation in order to enhance comparability with the grid unit analyses. The labels adopted were as follows.

Component I Newly Immigrant Community

Component II Life Cycle (Dealing Prestige)

Component III Elderly and Non-Local/Manufacturing Workers

Component IV Social Status (Age/Fertility)

Component V Feminism (Working Wives and Manufacturers)

Component VI Child Employment

Component VII Manufacturing (Age and Lower Status)

These labels suggest a general similarity between the ward and grid unit analyses for 1851, and the congruence coefficients presented in Table A1.2 tend to confirm this. WA1851 Component I resembles the ethnicity dimension of the grid unit analysis (GU1851 Component II). Similarly WA1851 Component II shares many of the characteristics of GU1851 Component I, and the seventh Components in the two analyses are very similar. But the differences between the two structures must not be under-stated. The first two Components in the grid unit analysis appear in reverse order in the ward analysis. Furthermore, the second Component of WA1851 contains a more substantial life cycle element than does the Social Status (Occupation, Household Composition) dimension which emerged from the grid unit data. It must be admitted that the second Component of WA1851 contained many of the characteristics which only developed later at grid unit scale. WA1851 Component II could not be interpreted as a family status axis, for it did not combine the full range of life cycle, fertility and feminist aspects. Differences between the two Components were therefore considerable, but not such as to conflict fundamentally with the hypotheses of Chapter 2 or with the findings of Chapter 8. The relatively blurred resemblance between Components III, IV, V and VI at the two scales gives further cause for concern.

9.12 A Factorial Ecology of Wolverhampton 1861 by Wards (WA1861)

As with GU1861 the level of inter-correlation was lower than in 1851, despite the larger sample size, with certain variables performing

conspicuously differently at the two dates. Variables suffering a dramatic decline in levels of correlation with others included 05 (adolescent employment), 07 (female heads), 12 (% aged 65+), 13 (mean age of head), 15 (non-local English and Welsh), 20 (% males gainfully occupied) and 24 (% mining). The only evidence in the literature suggesting 1861 was unlike 1851 is of doubtful relevance. Morton and Le Guillou (1967, 277) refer to a boom in the South Staffordshire iron industry reaching a peak in 1852, and - by contrast - fourteen year low in 1861 (ibid., 282). Many mines were part of integrated iron operations so that the link with mining, adolescent employment and male occupancy is clear; the other changes are, however, difficult to explain.

Table A1.3 in Appendix 1 presents the component loading matrix for WA1861, and again seven components were extracted for comparability. The following labels were adopted.

Component I Overcrowding, Ethnicity and (Low) Social Status

Component II Life Cycle (Status, Occupation)

Component III Feminism and Non-Locals/Familism and Mining

Component IV Manufacturing and Familism/Higher Status

Component V Age and Working Women/Working Males and Children

Component VI was not labelled

Component VII Child Employment, Locals and Manufacturing/Non-Locals

Table A1.4 shows the great similarity between the ethnicity axes at grid unit and ward level, and thus confirms their similar interpretation. WA1861 Component V is shown to be a reflection of the Feminism (Local Manufacturers) Component of GU1861. A rather lesser similarity is revealed between the first axis of GU1861 and the second of WA1861; the sixth Components of the two analyses are also seen to be similar. As in 1851, therefore, the order of the first two axes at grid unit level is reversed in the ward analysis. The significance of this is not

immediately apparent, but it may reflect the concentration of ethnic minorities within St. Mary's Ward and their under-representation elsewhere. By comparison, no single grid unit had such a heavy concentration of the Irish and other groups. In other respects, the differences between ward and grid scale analyses were rather less in 1861 than was the case in 1851; nevertheless the existence of these differences is an important conclusion to be drawn from the analyses described here.

9.13 A Factorial Ecology of Wolverhampton 1871 by Wards (WA1871)

The correlation matrix based on 1871 ward data resembled the other correlation matrices strongly though the level of inter-correlation was greater than for any other analysis. The degree of inter-correlation appears to have little influence upon the components extracted, though seven components explain a higher proportion of total variance in ward data than in grid unit data with lower levels of inter-correlation. Table A1.5 in Appendix 1 presents the component loading matrix, with seven components accounting for almost 100% of total variance. The labels chosen are listed below.

Component I Family Status (Dealing Prestige)

Component II Overcrowding, Ethnicity and (Low) Social Status

Component III Birthplace (Age/Mining and Familism)

Component IV Mining (Familism)/Feminism

Component V (Low) Social Status (Locals, Manufacturing/Non-Locals, Dealing)

Component VI Working Wives and Working Children

Component VII was not interpreted

WA1871 is thus the only ward analysis in which the order of the first two components corresponds with that found at grid unit level, and Table A1.6 shows that Components I and II correspond closely with GU1871 Components I and II. The similarity between the remaining axes in the

two analyses was more remote. This may not be particularly significant, for the minor axes are defined within the variance remaining once the main dimensions have been extracted. Slight differences in the main dimensions, random variation in the data and sampling errors are therefore combined in the pool of residual variance from which the minor components are constructed.

9.14 Summary: the ecology of social change 1851-1871 by wards

The important conclusion to be drawn from the ward analyses is not that the minor components tended to be rather unlike those derived in grid unit analyses, but that the major components were very similar - though in a different order. Few would hold a set of nine areal units sufficient to examine residential patterns in Wolverhampton. Aggregation to wards loses much information, and within-area variation must have been considerable. The important point is that differences between the minor axes at ward and grid level were not systematic and suggested no alternative interpretation of residential change. Ward and grid unit analyses shared an underlying pattern, and on top of this was random noise peculiar to the analysis concerned. The central question therefore concerns the extent to which increased scale affects the major dimensions of differentiation. Perhaps the most useful way to answer this question is to examine temporal changes in component structure at ward level. If the type of evolution isolated at grid scale ceases to be apparent when ward data are used then it must be conceded that the scale of analysis has a crucial influence upon the results and the conclusions they support.

Examination of the ethnicity dimension in the three analyses is easiest. Scrunity of the variable loadings (Tables A1.1, A1.3 and A1.5) shows that throughout the period 1851 to 1871 variables 16 (Irish), 18 (multiple occupancy), 21 (household size) and 02 (class IV and V) loaded positively on such a dimension. Clearly, high residential

densities, low social status and ethnic minorities were associated throughout the period. But, for 1851, additional loadings suggest that in wards with high proportions of Irish, males were over-represented whereas women, children and the Wolverhampton-born were under-represented. Male occupancy rates were also high in such areas and non-kin were disproportionately numerous. Finally, to confirm the low status position, child employment was relatively high. These characteristics of the newly immigrant community had begun to disappear in 1861 as complete social status differences emerged. By 1871 the overcrowded Irish ghetto exhibited no marked lack of children or of females, nor were male occupancy rates abnormally high; the Wolverhampton-born were, however, still under-represented. But, as at grid unit level, strong positive loadings by indicants of low status were now complemented by strong negative loadings by indicants of high status: newly immigrant characteristics had disappeared and the overcrowding/ethnicity axis had moved towards a more general social status dimension. Table A1.7 confirms the similarity between WA1851 Component I and WA1871 Component II.

The other major dimension at ward level is represented by the second components in 1851 and 1861, and by the first Component in 1871. Throughout the period these components shared strong positive loadings from variables 25 (dealing), 03 (servants) and 22 (non-kin). In addition there was a positive loading by variable 12 (% aged 65+) and a negative one by variable 10 (fertility ratio) which suggest that life cycle differences were present even in 1851 at ward scale. Detailed examination of the raw data confirms that, while at grid unit level age structure was very variable, there were consistently larger proportions over 65 in the wards with the greatest proportions in dealing occupations. In 1851 variables 01 (class I and II), 13 (mean age of head) and 23 (loners) also loaded in the same direction as dealing; the pattern

persisted in 1861. Additional negative loadings in 1851 were provided by variables 11 (heads with children) and 20 (males gainfully occupied). Thus in 1851 the second dimension of differentiation included not only dealing and associated household structure patterns but also social status and life cycle differences. The latter were particularly marked - dealing wards being characterized by an older population with fewer children and a smaller proportion of males gainfully occupied. In 1861 the pattern was very similar though adolescent employment and manufacturing occupations provided negative loadings which, together with the decline in the negative loadings of variables 11 and 20, suggested clearer differentiation in terms of status and occupation between areas with opposed scores on this dimension.

In 1871 the component centred upon dealing formed the first axis extracted. Strong loadings by social status indicants had disappeared and fertility differences were reinforced. Most important, however, were the positive loadings provided by variables 06 (% labour force, female) and 07 (female heads) contributing the feminist aspect of a rounded family status dimension which had previously been lacking. Table A1.7 suggests a considerable resemblance between WA1871 Component I and WA1851 Component II, though there are other slight similarities between the former and WA1851 Components I (Newly Immigrant Community) and V (Feminism (Working Wives and Manufacturers)).

These results suggest that, at ward level, a dimension with very strong life cycle elements was of great importance even in 1851. By 1871 a feminist element had admittedly been added thereto, but the overall change was less than that revealed in the grid unit analyses. The main reason for this lies in the character of the dimension in 1851. Even at this early date the clear and opposite loadings by indicants of low and high social status were absent and something approaching a family

status axis was already present. The major differences between wards were the proportions of Irish and the extent of overcrowding, the importance of dealing and the prevalence (or otherwise) of complex non-familist household structures. Pure status differences were less obvious, and there are several reasons for this. Firstly, many high and low status areas were grouped together within wards whereas Irish areas were grouped together in one ward while non-Irish areas were grouped into the remaining wards. Similarly, dealing tended to be concentrated largely within two wards. Secondly, ethnicity and family status/dealing dimensions both had social status elements so that social status differences linked with either axis were already "explained" by the first two components. This is important for the ward with the largest Irish population was of very low status. Thirdly, life cycle and household structure differences appear to be more important at ward level. Again the ethnicity dimension would include some of the distinctions between high and low status; in Irish areas non-kin were common but relatively few were loners whilst in high status wards non-kin were rarer and most of them were loners (servants, shopmen etc.). The family status/dealing axis also embraced a similar distinction. Further, at ward scale, low status areas tended to be mining and/or manufacturing wards with relatively large numbers of "normal" families including children. These characteristics were already accounted for in the distinction between dealing areas (with an older population) and non-dealing areas (with a younger age structure).

Many of the unexpected patterns may thus be attributed to the coarse level of aggregation. Changes like those observed in the grid unit analyses were apparent: the characteristics of recent immigration faded and ethnicity moved towards a general social status axis. Something approaching a modern family status dimension also emerged, but here the effect of scale was more important. Clearly, therefore, scale is an

important variable in any analysis of urban residential differentiation and must not be ignored simply because little is known about the scale at which particular types of pattern occur. Ideally each analysis should embrace several different scales; only in this way will a body of knowledge be built up regarding the scale at which various types of differentiation are manifest.

9.2 The Stability Of Conclusions With Respect To Changing Areal Units: Analyses Of E.D. Data

Not only were the EDs smaller than grid units (in terms of population) but their boundaries varied from census to census. It might seem that data aggregated to sub-optimal units should not be used for an analysis of temporal variation in the dimensions of differentiation because such changes would be distorted by boundary differences. The question of stability of conclusions with respect to changing areal units is raised, however, because of the great labour involved in aggregating to grid units. If the results suggests that similar conclusions would have been provided by ED data then considerable unnecessary work way be avoided or - and perhaps more likely - the same amount of effort will be used more profitably to increase sample sizes or to extract more variables. The overall level of correlation in ED analyses was relatively low, and any part of this which arose because of sampling errors and random noise could be reduced by larger sample sizes.

9.21 A Factorial Ecology of Wolverhampton 1851 by EDs (ED1851)

Though the level of correlation in ED1851 was relatively low, the pairs of variables linked by correlations stronger than ± 0.5 were generally those similarly related in GU1851. The single most discordant feature between the two analyses was the dramatic decline in the inter-correlation of variable 03 (servants) and other variables. Appendix A2 contains the detailed analysis and interpretation and Table A2.1 presents the

components loading matrix for ED1851. With a minimum eigenvalue of 1.0 seven components were extracted accounting for 71.5% of total variance (cf. 81.4% from seven components in GU1851 with rather less "noisy" data). As with the ward analyses 25 variables were input - the 26 of the grid unit analyses less variable 17 (density by grid square). The seven components extracted were labelled as follows.

Component I Newly Immigrant Community

Component II Working Class/Higher Status Non-Locals

Component III Family Status

Component IV Working Wives and Local Born

Component V Life Cycle

Component VI Occupation (Manufacturing/Mining)

Component VII Familism (Low Status)

Table A2.2 compares ED1851 with GU1851 using Veldman's congruence coefficients, and the similarity between the ethnicity dimensions in the two analyses is obvious. The general level of the largest coefficient in each column is perhaps rather higher than those in Table A1.2 indicating a greater similarity between ED analysis and grid unit analysis than between WA1851 and GU1851. Nevertheless the degree of similarity between individual components at ED and grid unit levels is disappointing and must suggest that again, scale is having a significant effect.

9.22 A Factorial Ecology of Wolverhampton 1861 by EDs (ED1861)

Though the level of inter-correlation was lower in the ED1861 analysis than in any other, the components extracted appear no less meaningful than those based upon more inter-correlated data sets. Table A2.3 shows the variable loadings on the seven components with eigenvalues exceeding unity. Together they accounted for only 68.2% of total variance - the lowest value encountered so far at any level. The labels chosen were:

Component I Social Status (Occupation, Household Composition, Sex)

Component II Overcrowding and Ethnicity

Component III Manufacture and Working Wives/Mining and Familism

Component IV Life Cycle

Component V was not labelled

Component VI Birthplace

Component VII Working Males and Children

As Table A2.4 shows the component structure of ED1861 was very similar to that of GU1861 with the first two components in the former being closely replicated in the first two components of the latter. In fact the ED1861 component with the weakest resemblance to any component in GU1861 was ED1861 Component III with a congruence coefficient of 0.7 against GU1861 Component III. Overall, therefore, the degree of similarity was very marked.

9.23 A Factorial Ecology of Wolverhampton 1871 by EDs (ED1871)

Table A2.5 shows the components loading matrix for ED1871 with seven components whose eigenvalues exceeded 1.0 accounting for 67.8% of total variance - lower than in any other ED, grid unit or ward analysis. Despite this, interpretation of the components proved particularly interesting. The labels adopted were:

Component I Family Status (Dealing Prestige)

Component II Low Social Status (Manufacturing)

Component III Overcrowding, Ethnicity and (Low) Social Status

Component IV Local, Manufacturing/Non-Local, Dealing

Component V Feminism (Dealing/Mining)

Component VI Occupied Males and Manufacturing/Mining

Component VII Household Composition (Family Nuclei/Loners)

Table A2.6 shows that the first three components strongly resemble the first three axes of GU1871 - though the second and third are reversed.

The overall similarity between the remaining components in the two analyses is perhaps rather less. Scale differences are again seen to be significant. The important question, however, concerns the extent to which boundary differences and scale effects together manage to distort or obscure the temporal changes previously recognized at grid unit level.

9.24 Summary: the ecology of social change 1851-1871 by EDs

As in Section 9.14 little attention will be given to differences between the minor dimensions over the three censuses since the components which describe them are largely the products of variance "left over" when the major axes have been extracted. Instead, interest will focus on the leading Components in the three analyses.

Throughout the period there was a Component with strong positive loadings by variables 16 (Irish), 18 (multiple occupancy), 21 (household size) and 02 (class IV and V). In 1851 an additional positive loading was provided by variable 22 (non-kin) with negative loading from variables 14 (Wolverhampton born) and 23 (% non-kin, loners). By 1871 these vestiges of the newly immigrant community had been displaced by movement towards a more general social status axis as revealed in the markedly opposite loadings on the ethnicity dimension of variables 01 (class I and II) and 02 (class IV and V). It must be conceded, however, that the full range of "newly immigrant community" characteristics were not represented by variables providing loadings stronger than ± 0.4 on the ethnicity Component of 1851. This is due partly to the arbitrariness of a value such as ± 0.4. Hence in 1851 variable 19 (sex ratio) loaded at 0.33 on Component I (indicating the maleness of immigrant areas) compared with 0.06 on the ethnicity Component of 1871 (when new immigrant characteristics had faded). But it also stems from differences between the grid unit and ED analyses. Children do not appear markedly lacking, nor are occupied males over-represented in the new immigrant communities

as seen at ED level. Although the same major trend can be identified using ED or grid unit data it is very much clearer in the latter. The reason may lie in the low sample sizes of ED1851, for certainly that analysis is less similar to the contemporary grid unit analysis, than is any other ED based factorial ecology. Comparison of Tables A2.2, A2.4 and A2.6 confirms that this is so.

The three ED analyses are all alike in including one major component centred upon dealing, high status and low fertility ratios. In 1851 this component included positive loadings by variables 06 (% labour force, female), 07 (female heads), 13 (mean age of head), 22 (non-kin) and 23 (loners); variable 24 (mining) provided a negative loading. This particular pattern of loadings is rather difficult to explain. An almost complete family status dimension is not expected so early. It is possible to find faults with ED1851 Component III - the absence of a marked negative loading by variable 11 (heads with children) and of a strong positive loading by variable 12 (% aged 65+) for example - but it must be admitted that both life cycle/fertility and feminist aspects are represented. True the sample sizes were relatively small, and true also that ED1851 is less like GU1851 than might be expected, but the Family Status axis represented by ED1851 Component III cannot be argued away. In 1861 no such near-complete family status axis was present for feminist aspects were lacking. Indeed loadings on ED1861 Component I are very much what might be expected on the basis of the grid unit analysis. High status dealing areas contained many non-kin, loners and servants, but relatively few males, children or workers in manufacturing and mining. There was also a strong negative loading by variable 02 (class IV and V) which, coupled with the very strong positive loading by variable 01 (class I and II), reveals the clear status differences between opposite extremes on this dimension.

By 1871 the clear class dichotomy had disappeared, though dealing was still associated with above average proportions in classes I and II. Along with the dealing prestige element there were clear life cycle differences; dealing areas tended to contain older heads, fewer of whom had children, and also a larger proportion aged over 65 than areas with strong negative scores on this dimension. If only loadings stronger than ± 0.4 were considered ED1871 Component I would not warrant the label Family Status (Dealing Prestige) since no feminist elements would be represented thereby. But variable 07 (female heads) loaded at 0.28 compared with 0.10 in 1861 and variable 06 (% labour force, female) loaded at 0.29 so that, in the weaker loadings, feminist aspects were not wholly lacking.

Nevertheless, it might be argued - with some justification - that there was a prominent family status-type dimension in 1851 which had disappeared by 1871 in complete contradiction of the hypotheses developed in Chapter 2 and of the grid unit results presented in Chapter 8. The validity of this position is conceded, but it must also be noted that in 1851 the family status axis appeared as the third Component in 1851, the first and second being respectively ethnicity and social status dimensions. The social status Component in fact suggested connections between high status and complex households so that dimensions of the type hypothesized were not wholly lacking. More generally, however, the effect of scale and boundary differences is seen to be considerable. By contrast with the grid unit analyses, neither the ward nor the ED analyses produced a consistent ordering of the major components for all three censuses. Nor were the variations at ward level the same as those produced using ED data.

If many of the major temporal changes were apparent across all three sets of areal units, the changes which were distorted or obliterated by

particular types of analyses were substantial. It must therefore be concluded that the scale of analysis is important, and that constant boundaries are to be preferred - if only because one of the many possible sources of spurious "temporal change" is thereby excluded.

9.3 The Stability Of Conclusions With Respect To Alternative Analytical Techniques

The potential impact of arbitrary analytical decisions upon the conclusions of empirical analyses has recently been stressed by Openshaw et al. (1976), and it is desirable to compare the results presented in Chapter 8 with those which would have been produced using similar but alternative methods. As was suggested in Chapter 7, the analytical decisions likely to have been important in this respect are the choice of factoring procedure, the choice of rotation, and the attitude towards variable transformation and population weighting. Each of these issues will be treated in turn. All tables relevant to the discussion are placed in Appendix A3 since they are not essential to an understanding of the main conclusions.

9.31 Choice of Factoring Procedure

Three alternatives to a simple principal components solution were examined. Principal Axis Factor Analysis with iteration produces inferred factors (rather than mere combinations of the original variables) since the main diagonal of the correlation matrix is replaced by communality estimates which are repeatedly revised until convergence, at a specified level, is achieved. In the program adopted here the initial communality estimates were provided by the squared multiple correlation between the given variable and all other variables. In some runs, however, the determinant of the matrix was too small for this approach and the absolute value of the biggest element in each column was used as the communality estimate instead. When this latter alternative applied it was found

that convergence often required a far larger number of iterations. As Appendix A3 shows, the results were very similar to those provided by principal components analysis. The major factors appeared in precisely the same order and, after varimax rotation, suggested almost identical interpretations to those adopted for the leading components derived by principal components analysis of the same data. Table A3.1 presents the factor loading matrix.

Alpha Analysis was also successfully employed and, as it assumes input variables form only a sample of the universe of variables whilst the universe of cases is represented, it was felt to be particularly relevant in view of the limited range of census attributes. Experience with alpha analysis followed by varimax rotation (Table A3.2) showed that the first factor tends to be far more general than with the other methods used. In 1851 the first factor heaped together very many social status, occupational, household complexity and some family status variables, and even in 1871 the first factor still embraced status and occupational elements as well as household compositional variables. This may appear to conflict with the supposed divergence of socio-economic and family status dimensions, but in fact the relevant changes were represented by the presence in 1871 of a clear family status-type Factor II which was largely free from social status overtones. It will be noted that the order of the Factors presented in Table A3.2 does not correspond with that of similar axes extracted using principal component techniques.

The possibilities of Image Analysis were investigated unsuccessfully, for the program continually failed owing to the smallness of the determinant of the correlation matrix. Computer specialists were unable to solve the problem, and the approach was therefore abandoned. Comparison of principal component analyses, principal axis factoring and alpha analyses over the three sets of grid unit data strongly suggested that the choice

of factoring procedures had little effect upon the type of temporal changes observed. This conclusion corresponds closely with that of Giggs and Mather (1975). Certainly the choice of factoring procedures appeared to have less effect than the choice of areal units!

9.32 Choice of Rotation

Varimax rotation was compared with two other orthogonal procedures (EQUIMAX and QUARTIMAX) and with an oblique approach. None of the three alternatives produced major departures from the earlier interpretations, despite Davies claim (1971) that varimax rotation destroys the generality of the structure, but there were considerable differences in the sharpness of focus of the picture that emerged.

Quartimax (Table A3.3) brought out the first three or four factors almost to the point of exaggeration whilst the remainder were reduced to a single strong positive or negative loading and very many near-zero elements. Because the main factors had strong loadings from a relatively large number of variables the temporal changes revealed were split in two. Part of the change was reflected in the different variables in combination at different dates, but another part resided in variations in the relative importance of variables with strong loadings. Equimax (Table A3.4) performed better in this respect and compared very well with varimax rotation. Indeed, whereas use of quartimax would have hampered the present analysis, use of equimax would have been as effective as use of varimax.

Finally, Oblique rotation was felt especially relevant to residential differentiation, there being no empirical justification for assuming that major differentiating dimensions are unrelated (Davies, 1971, 112). In the nineteenth century context such an assumption is insupportable for links between socio-economic status and both family status and ethnicity are to be expected. With the abandonment of orthogonality constraints

the possibility of correlations between factors arises (e.g. Semple, 1969). But use of oblique rotation (Table A3.5) produced no startling insights and the major dimensions of differentiation again emerged. The analysis presented in Appendix 3 is based upon a moderately oblique solution. At this level the intercorrelation between factors is very instructive and is particularly useful when interpretation and labelling is attempted. But, as Table A3.6 shows, the degree of inter-correlation is too weak to be really interesting. It was felt that a more oblique solution providing greater inter-correlation would be more enlightening. Unfortunately, this did not prove to be the case and some of the most oblique solutions attempted proved difficult to interpret. Certainly oblique rotation did not offer the type of breakthrough that its apparent aptness suggested. In addition, Veldman's factor comparison program, developed for orthogonal rotations (Veldman, 1967, 237), would have been redundant had oblique rotation been adopted.

Rotations did have some effect upon the clarity with which patterns emerged but - in general - did not distort the types of conclusions which might emerge. Though some rotations were therefore preferred on the grounds of interpretability there is little suggestion that this preference materially influenced the conclusions which finally emerged.

9.33 Transformation and Weighting

Grid unit data for 1871 were analysed respectively in untransformed and unweighted forms. Tables A3.7 and A3.8 demonstrate that decisions regarding transformation and weighting have an unmistakeable impact upon the resultant components. But when interpretations rather than raw loadings were considered the differences between alternative approaches was reduced, and when temporal change was examined the effect was even smaller. Transformation affected factor scores most - reducing the absolute value of extreme positive and negative scores. In some cases

this made factor scores easier to map for the tendency to produce one huge positive or negative score and many comparatively insignificant variations was lessened. Weighting was found to have a complex effect which is not easily explained. Weighted and unweighted data sets did produce rather different results, but there was no obvious way in which one was superior, clearer or more easily interpreted than the other. Indeed, there were no simple criteria by which the two sets of results might be judged. Weighting was finally adopted as standard practice for the results presented in Chapter 8 simply because it took account of variations in population distribution (across the grid units) between censuses and so removed another potential source of spurious "temporal change".

To conclude therefore, weighting and transformation affected the patterns of loading in an unsystematic almost "random" way but the interpretations which the new components bore were very little different from those presented in Chapter 8.

9.34 Conclusions

It is apparent that arbitrary operational decisions such as the choice of factoring and rotational procedures and the attitude towards weighting and transformation had far less impact upon the ultimate interpretation - and upon the temporal changes observed - than did the scale of analysis. While different boundaries threatened to overthrow some of the central conclusions of the grid unit analyses, different analytical procedures merely affected the clarity with which such conclusions were suggested. All of the alternative analytical procedures revealed a temporal evolution in both the ethnicity and in the dealing-centred dimensions whereas analysis by EDs cast serious doubt upon the supposed movement from a dealing/household complexity/social status axis towards a dealing/family status dimension.

9.4 The Stability Of Conclusions With Respect To An Alternative Treatment Of Temporal Change

All of the techniques so far considered have been based upon a similar treatment of change. Cross-sectional analyses have been performed at three points in time and it has been assumed that temporal change could be deduced from the differences between successive cross-sections. An alternative approach might be to analyze a matrix not of straight variable scores but of the change in those scores between successive censuses. Experiment proved that analysis of crude changes in variable scores provided results which were more easily interpreted than analysis of relative change indices (where crude change is expressed as a proportion of the initial value of the variable). Population weighting posed something of a conceptual problem since it was felt highly undesirable to weight according to the magnitude of the intercensal population change: areas of suburban expansion would have been overemphasized by such a procedure. Finally it was decided to weight according to the population at the later date, though comparison showed that similar decisions would have been derived using the population at the earlier census. The results were therefore based upon principal component analysis (and varimax rotation) of a matrix of crude changes in the scores of 26 variables. Grid unit data were used to permit computation of intercensal changes on a constant areal framework, and these data were weighted by the population of the later census. Tables A3.9 and A3.10 in Appendix 3 present the component loadings matrices for analyses of intercensal change 1851-61 (CHANGE51-61) and 1861-71 (CHANGE61-71) respectively. Similar results for the period 1851-71 are not presented because the changes revealed may be seen in more detail in the analyses 1851-61 and 1861-71.

9.41 The Analysis CHANGE51-61

The variables submitted for this analysis were changes between 1851 and 1861 with increases represented as positive and decreases as negative

values. Strong positive loadings therefore indicate large relative increases though the absolute change may have been a small decrease if the variable concerned declined markedly over the period. Examination of means and standard deviations for each "change variable" proved that this was sometimes the case.

Nine components had eigenvalues greater than 1.0 and together accounted for 80.5% of total variance, and though this seemed an excessive number it was decided to retain all of them for comparability with the grid unit analyses of Chapter 8. Only the first four components are discussed here since it has been argued that variations between minor components are of little significance (see Table A3.9).

CHANGE51-61 Component I

Loadings +0.7 or higher, variable 03 (servants).
Loadings +0.4 to +0.69, variables 01 (class I and II0, 13 (mean age of head) and 12 (% aged 65+).
Loadings -0.7 or lower, variable 26 (manufacturing).
Loadings -0.4 to -0.69, variables 05 (adolescent employment), 19 (sex ratio) and 10 (fertility ratio).

Component I was lavelled Increasing Social Status and Age since it distinguishes between areas wehre social status increased and the population aged from those where status declined and age structures became younger. In the latter areas an increase in manufacturing employment appears to have been coupled with an influx of males.

CHANGE51-61 Component II

Loadings +0.7 or higher, variables 21 (persons per household), 18 (family nuclei per 100 households) and 17 (density).
Loadings +0.4 to +0.69, variables 22 (% households with non-kin) and 19 (sex ratio).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 23 (% non-kin, loners).

Component II distinguishes areas where there were strong relative increases in the measures of overcrowding and a relative decrease in the importance of non-kin loners from areas where the reverse was true. It is interesting that no ethnicity element strongly attaches to this axis.

The label Increasing Crowding was adopted to suggest this neutrality with respect to immigration, despite the indication of increasing maleness which often accompanied the development of migrant zones and may therefore imply immigration from elsewhere in England and Wales.

CHANGE51-61 Component III

Loadings +0.7 or higher, variables 07 (female heads) and 06 (% labour force, female).
Loadings +0.4 to +0.69, variable 13 (mean age of head).
Loadings -0.4 or lower, absent.

Component III was labelled Increasing Feminism and Age.

CHANGE51-61 Component IV

Loadings +0.7 or higher, variable 16 (Irish).
Loadings +0.4 to +0.69, variable 10 (fertility ratio).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 20 (males gainfully occupied).

Areas scoring strongly positively on this axis experienced relative increases in the proportion of heads who were born in Ireland and in fertility ratios, while male occupancy rates suffered a relative decline. Interpretation was complicated by the fact that both intensification of Irish concentrations in the ghetto and expansion into "non-ghetto" areas would constitute increases in the proportion of Irish-born heads. Detailed examination of location quotients revealed both expansion and concentration with the gradual increase in the proportion of Irish in the area immediately north-east of the town centre. The label Irish Expansion - Concentration and Normalization was chosen to suggest expansion by concentration into the areas between the established ghetto and the city centre; at the same time low fertility and high male occupancy rates, typical of new immigrant communities, disappeared.

9.42 The Analysis CHANGE61-71

Ten components yielded eigenvalues greater than 1.0 and together accounted for only 79.4% of total variance, indicating an even "noiser" solution than CHANGE51-61. The component loading matrix is presented in Table A3.10.

CHANGE61-71 Component I

Loadings +0.7 or higher, variables 03 (servants) and 01 (class I and II).
Loadings +0.4 to +0.69, variables 25 (dealing) and 22 (households with non-ki
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 05 (adolescent employment).

This Component suggested a clear contrast between areas where status, the proportions in dealing occupations and the prevalence of servants (and hence of non-kin) had increased and areas where status had declined. Because of the concentration of dealing in the central area this was at first thought to imply an intensification of the pre-industrial pattern with high status heavily concentrated in the city centre. But examination of location quotients (and, later, the mapping of component scores discussed in Chapter 10) demonstrated the fallacy of such an interpretation. Dealing employment, servants and high status groups were in fact leaving the central area, as suggested in Chapter 2, and concentrating in the suburbs - particularly those west of the centre. Lawton (1955) describes a similar loss of high status merchants from central Liverpool. It should be noted that the degree of concentration of dealing and higher status groups in the suburbs may still have been lower than in the town centre for Component I merely isolates the trend towards High Status Suburbanization.

CHANGE61-71 Component II

Loadings +0.7 or higher, variables 21 (household size) and 11 (heads with children).
Loadings +0.4 to +0.69, variable 14 (Wolverhampton born).
Loadings -0.4 or lower, absent.

Component II suggested two possible processes. If couples newly settled in a suburban area produced families then household sizes, the proportion of heads with children and the proportion of the population born in Wolverhampton would all rise in that area. Similarly, if a suburban area was increasingly settled by families from elsewhere in the city the same changes might be observed. Examination of location quotients (and later mapping of component scores) suggested that both processes

were operating but that the latter was perhaps much the more important. The label Suburbanization of Family Life (Locally Born) was therefore adopted.

CHANGE61-71 Component III

Loadings +0.7 or higher, variable 12 (% aged 65+).
Loadings +0.4 to +0.69, variables 13 (mean age of head) and 20 (male occupancy).
Loadings -0.7 or lower, variable 10 (fertility ratio).
Loadings -0.4 to -0.69, absent.

Component III was labelled Population Ageing.

CHANGE61-71 Component IV

Loadings +0.7 or higher, variable 20 (male occupancy).
Loadings +0.4 to +0.69, variables 04 (child employment) and 24 (mining).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 06 (% labour force, female) and 17 (density)

Component IV was interpreted as Mining Expansion.

9.43 Patterns of Temporal Change

In examining the components produced by analysis of matrices of inter-censal change it is quite clear that the dimensions are of a kind different from those previously considered. The dynamic element is already present and does not need to be inferred from successive analyses. Nevertheless the two alternative approaches produce surprisingly consistent views of the changes in residential patterns during the period. Component I for 1851-61 isolates a trend towards an older, higher status population; similarly Component I for 1861-71 an increase in the higher status population groups; both refer to the development of high status suburbs. The opposite extremes in the two periods were, however, rather different. In 1851-61 the polar opposite of expanding high status suburbs was expanding manufacturing areas with more males, more adolescent employment and increased fertility ratios. In 1861-71, however, the declining status of central areas was in marked contrast with the expansion of high status suburbs. (Figure 10.7, discussed later, documents this trend).

In both 1851-61 and 1861-71 the third Component referred to the movement in age structures, particularly in the central areas, towards the older age groups. Significantly, this trend is linked with an increase in the number of female heads and in the importance of women in the labour force over the period 1851-1861. Both approaches to temporal change therefore suggest that the central area of the city declined in status and became increasingly dominated by a relatively elderly population with many female heads and significant female employment. In addition, both suggest the decline of newly immigrant community characteristics in the Irish ghetto; Component IV of 1851-61 in fact reveals the higher fertility ratios and the reduced male occupancy rates suggested by comparison of GU1851 and GU1861. Weaker loadings admit an increase in the proportion of the population aged over 65 and in the proportion born in Wolverhampton. Two striking features, however, are hte increase in both the proportion of heads born in Ireland and in the maleness of sex structures. The latter is revealed by relatively weak loadings, yet seems to confirm that the Irish immigrant population was becoming more concentrated, and not more dispersed, as other population characteristics became more normal. This point is examined in greater depth in Chapter 10.

Broadly, therefore, it may be accepted that analysis of matrices of change between censuses leads to conclusions very similar to those based upon comparison of successive single-census studies. The two approaches confirm and strengthen each other for only the mode of presentation differs. It is difficult to decide which method is better; analysis of matrices of change is less affected by distortions due to subjective interpretation but lacks some of the fineness of detail of the alternative method. Comparison of single-census studies has the attraction of direct relevance to theoretical statements about changes

in the dimensions of residential differentiation, but it must be admitted that the two approaches present complementary, rather than alternative, views of the evolution of residential patterns. Dimensions such as High Status Suburbanization and Increasing Feminism and Age (in the city centre) may be invoked as explanations of the trend away from a composite social status/household complexity axis and towards a family status dimension. Hence the results of the two approaches are consistent, and each provides for a better understanding of the other.

9.5 Conclusion: The Stability Of The Conclusions With Respect To Different Approaches

Whilst most important conclusions were unaffected by the scale of analysis, the factoring and rotational procedures, the attitude towards transformation and weighting, and the treatment of temporal change certain important conclusions derive from the analyses reported in this Chapter.

First, the scale of analysis appears to have a considerable effect upon the dimensions of residential differentiation revealed. Whether this conclusion is valid for analyses at different scales yet with very similar sampling errors cannot be judged, but it is clear that the scale of analysis is an important variable which must not be overlooked. Far more evidence is needed before any attempt can be made to define the scale at which different variables operate. Only when this evidence is available will it be possible to assess the role of individual variables in the changing dimensions of residential differentiation. Ultimately there may prove to have been temporal changes in the scale (as well as in the dimensions) of residential differentiation.

Secondly, the choice of factoring and rotational procedures is not so crucial as to determine the conclusions of an analysis, but may affect the clarity with which such conclusions emerge. Again more research is needed. Some of the variables used violate statistical assumptions

underlying the use of product-moment correlation coefficients and it would be useful to know exactly how the alternative factoring procedures were affected by this. Similarly, expert advice regarding the appropriacy of the various factoring and rotational techniques would be useful to the factorial ecologist. The need for transformation is another area of disagreement amongst geographical users of components analysis and there appears to be no statement about the sensitivity of different procedures to highly skewed distributions. Regarding population weighting it is easier to draw firm conclusions. When a fixed sub-areal framework has been adopted to allow intercensal comparison, it is sensible to take account of variations in population distribution with respect to that sub-areal frame by weighting. Unfortunately the present results show that weighted and unweighted analyses are slightly different, but does not demonstrate the superiority of the former.

Finally, it is argued that analysis of intercensal change scores should be seen as a complementary rather than an alternative approach. Comparison of single-census studies is illuminated by, and illuminates, analysis of matrices of change. Together, the two approaches furnish a fuller picture of changing urban residential patterns, each helping to ensure correct interpretation of the other. Temporal change is seen from different - but related - viewpoints and the two procedures thus provide consistent and complementary results.

To summarize, variations in the approach adopted may affect the clarity with which a particular pattern emerges and change minor components considerably. Far more research into the analytical techniques themselves is therefore required before it is possible to specify the "best" procedure for a given purpose. Not only is the precise method adopted in Chapter 8 likely to prove to have been sub-optimal, but the value of evidence gained from an alternative viewpoint has already been admitted. Nevertheless

it seems unlikely that the major substantive conclusions of Chapter 8 will be obscured merely by the adoption of a different analytical technique. The results presented here show that these conclusions are relatively stable with respect to alternative approaches.

CHAPTER 10 IMPROVEMENT OF THE SIMPLE 'PROCESS-FUNCTION' APPROACH

Despite the need for an overall form-function-process approach, the present work has so far adopted a simple process-function strategy. In Chapter 2 it was hypothesized that there was a temporal evolution in the dimensions of residential differentiation during rapid urbanization and growth. It was suggested that the trend of the evolutionary process would be away from the composite social status/family status axis of the pre-industrial city and towards the modern pattern with independent social status and family status dimensions. Chapter 8 presented results which strongly confirmed these earlier hypotheses, and Chapter 9 demonstrated that very similar conclusions would have been derived using alternative approaches. Before the overall findings are summarized it is desirable to consider the various ways in which the simple process-function approach adopted here might be extended and improved in order to offer further insight into the development of urban residential patterns during industrialization.

The present Chapter therefore contains four major sections. Section 10.1 attempts to examine the spatial pattern of urban residential neighbourhoods by considering the extent of congruence between the quality of the residential environment in an area and the social character of the population resident therein. In so doing, great reliance will be placed upon the description of Wolverhampton presented in Chapter 3. Section 10.2 evaluates the connections between individual relationships and the dimensions of residential differentiation which have been derived from ecological data. A central criticism of the factor ecological approach stems from the impossibility of inferring individual correlations from ecological ones, and it is therefore desirable to assess the extent to which perceptions based upon small area statistics differ from those derived directly from

individual data. Section 10.3 draws together the conclusions of the two earlier sections with those of Chapter 8 and presents an overall view of the changing patterns of residential differentiation in Wolverhampton between 1851 and 1871. In offering such a general summary, Section 10.3 also examines the implications of the present findings for the hypotheses of Chapter 2. Finally, Section 10.4 is more speculative, offering sign-posts for further research. Whereas Sections 10.1 and 10.2 relate to improvements upon the simple process-function approach which it was possible to implement, Section 10.4 considers improvements beyond the scope of the present study and requiring more detailed analysis.

10.1 Spatial Patterns And The Quality Of The Residential Environment: Inter-System Congruence

10.11 Spatial Variations in Socio-Economic and Family Status

Figures 10.1 and 10.2 map the scores on the first Components of GU1851 and GU1861 respectively. The former was interpreted as Social Status (Occupation, Household Complexity) and is distributed concentrically with positive scores in central areas and negative scores in the suburbs. One exception is the north-west with a very small but high status population; areas with numerically and proportionately significant high status populations were more central. GU1861 Component I was labelled Dealing Prestige (Family Status) and although it forms a similar pattern with large positive scores centrally located the distribution differs in extending further southward from the centre and in concentrating in the south and west rather than in the north-west. The greater importance of life cycle differences at the later date seems to have been responsible for this. Thus in Figure 10.3, showing the scores on GU1871 Component I - Family Status (Dealing) large positive scores immediately south of the central zone and in the western suburbs are even more marked. In this latter axis life cycle differences and variations in the role of women were paramount.

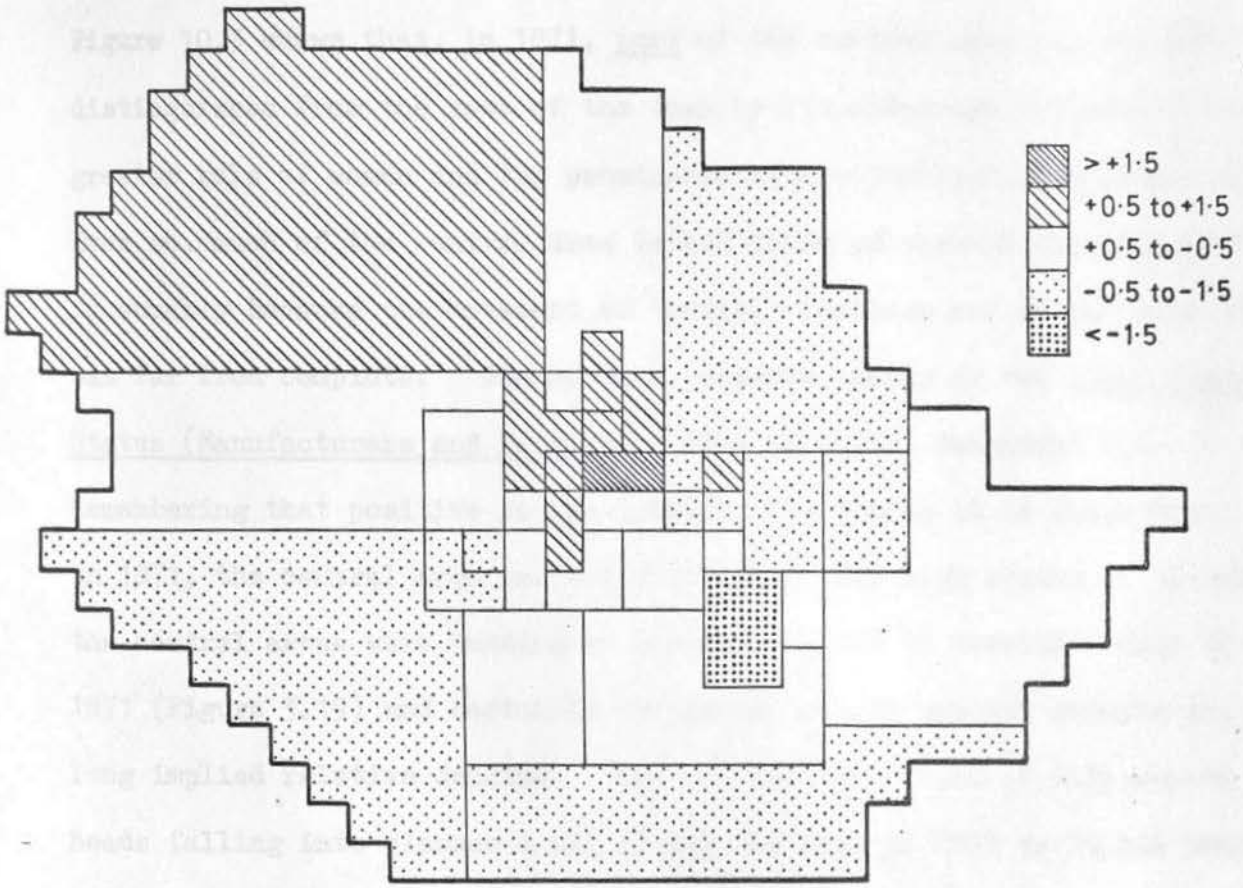


Figure 10·1: Component Scores : Gu 1851 Component I

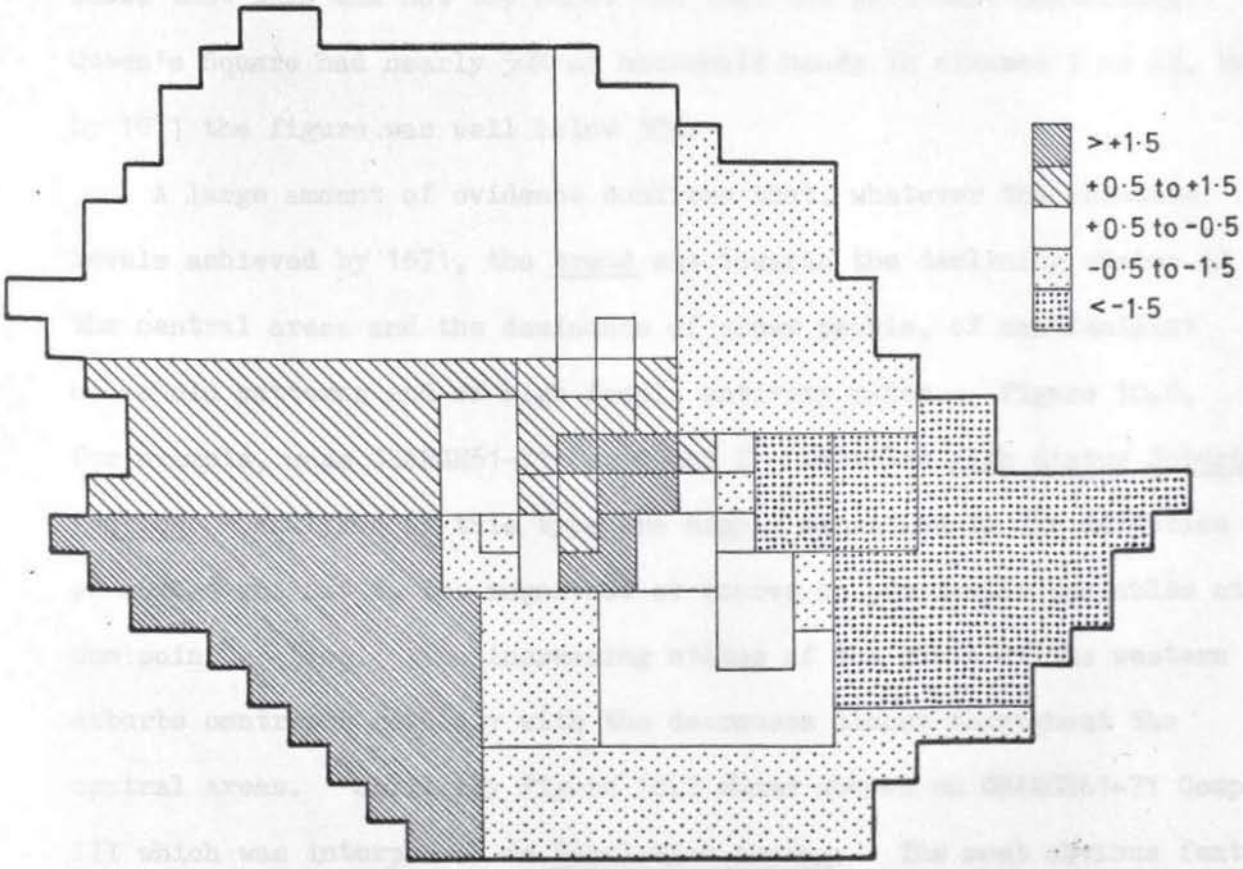


Figure 10·2: Component Scores : Gu 1861 Component I

Figure 10.3 shows that, in 1871, part of the central area was strongly distinguished from the rest of the town by its older age structure, the greater role of women and the prominence of non-familist household structures. Even so, much of the central area lacked these pronounced characteristics - presumably because the movement of "normal" families out of the city centre was far from complete. Figure 10.4 presents scores on the (Low) Social Status (Manufacturers and Fertility) axis of GU1871 Component III. Remembering that positive scores indicate low status it is clear that, in 1871, the central area was still of relatively high status. Nevertheless the central areas were tending to lose population in absolute terms by 1871 (Figure 3.19) and certainly the growth of the western suburbs had long implied relative decline. Even if the proportion of city centre heads falling into classes I and II was the same in 1871 as it had been in 1841 then its relative importance as a high status residential area would therefore have declined. But comparison of Figures 3.7 and 10.5 shows that this was not the case: in 1841 the grid unit containing Queen's Square had nearly 50% of household heads in classes I or II, but by 1871 the figure was well below 30%.

A large amount of evidence confirms that, whatever the absolute levels achieved by 1871, the trend was towards the declining status of the central areas and the dominance of older people, of non-familist household patterns and of high female activity rates. Figure 10.6, for example, maps CHANGE61-71 Component I - labelled High Status Suburbanization. Analyses of this type are highly sensitive to the direction of change and not to the magnitude of scores on particular variables at one point in time. The increasing status of the whole of the western suburbs contrasts markedly with the decreases almost throughout the central areas. Similarly Figure 10.7 shows scores on CHANGE61-71 Component III which was interpreted as Population Ageing. The most obvious feature

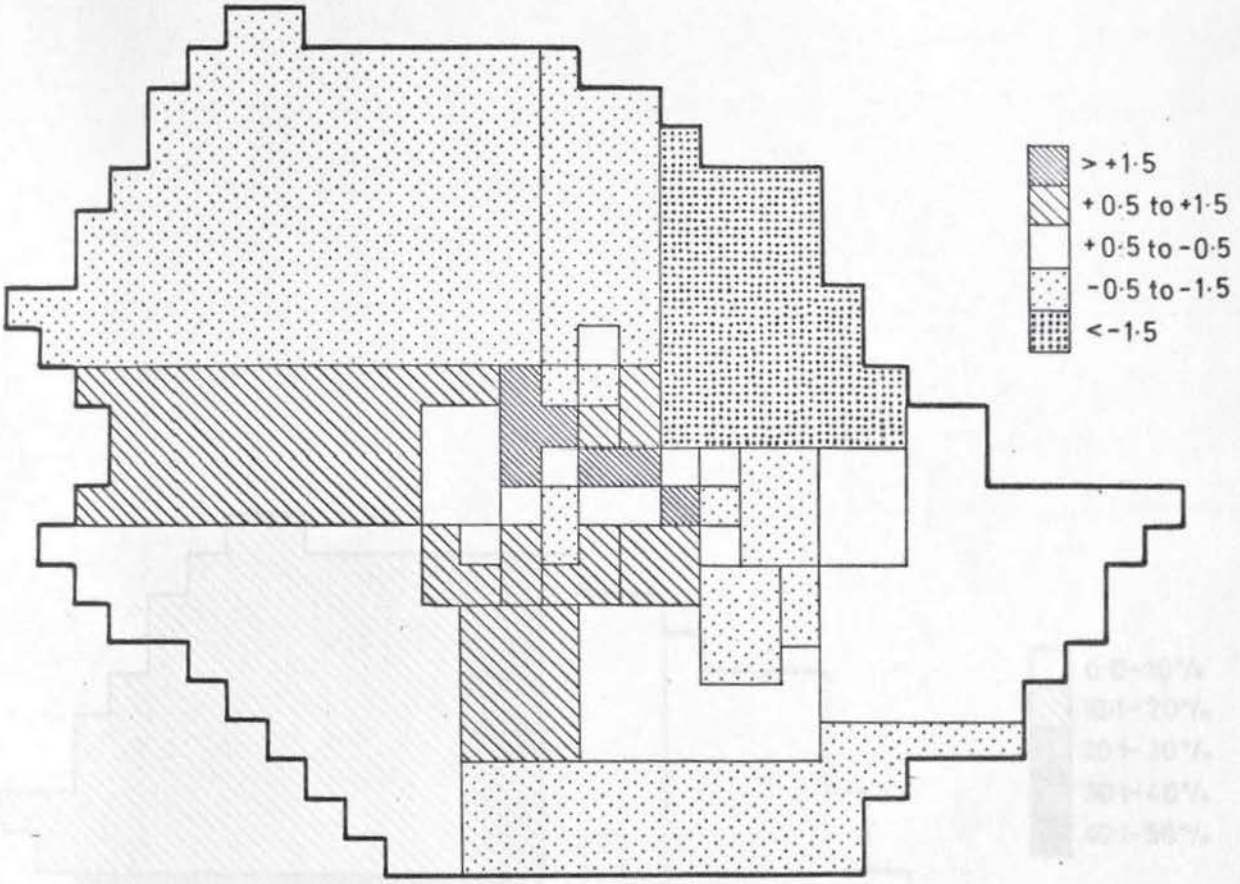


Figure 10·3: Component Scores: Gu 1871 Component I

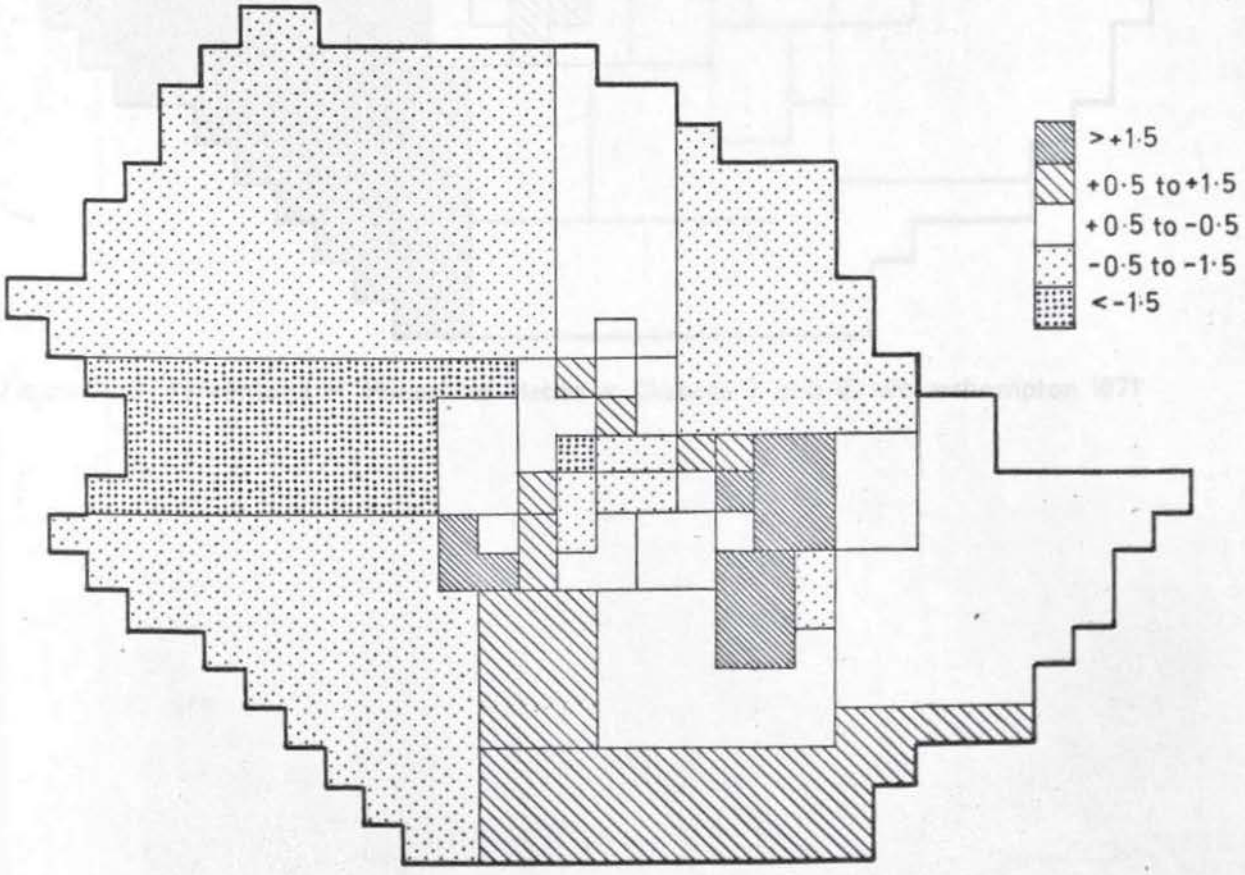


Figure 10·4: Component Scores: Gu 1871 Component III

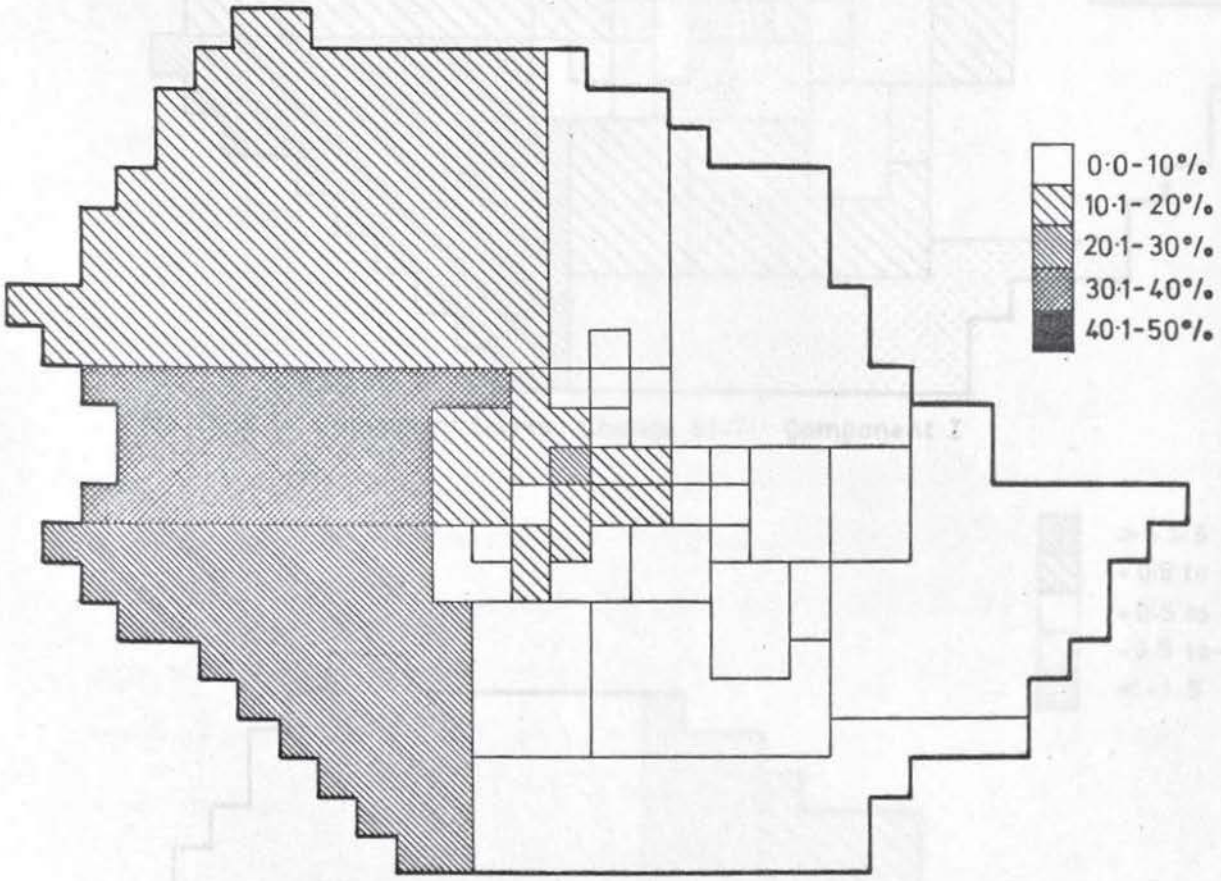


Figure 10·5: Percentage of Household Heads in Classes I and II: Wolverhampton 1871

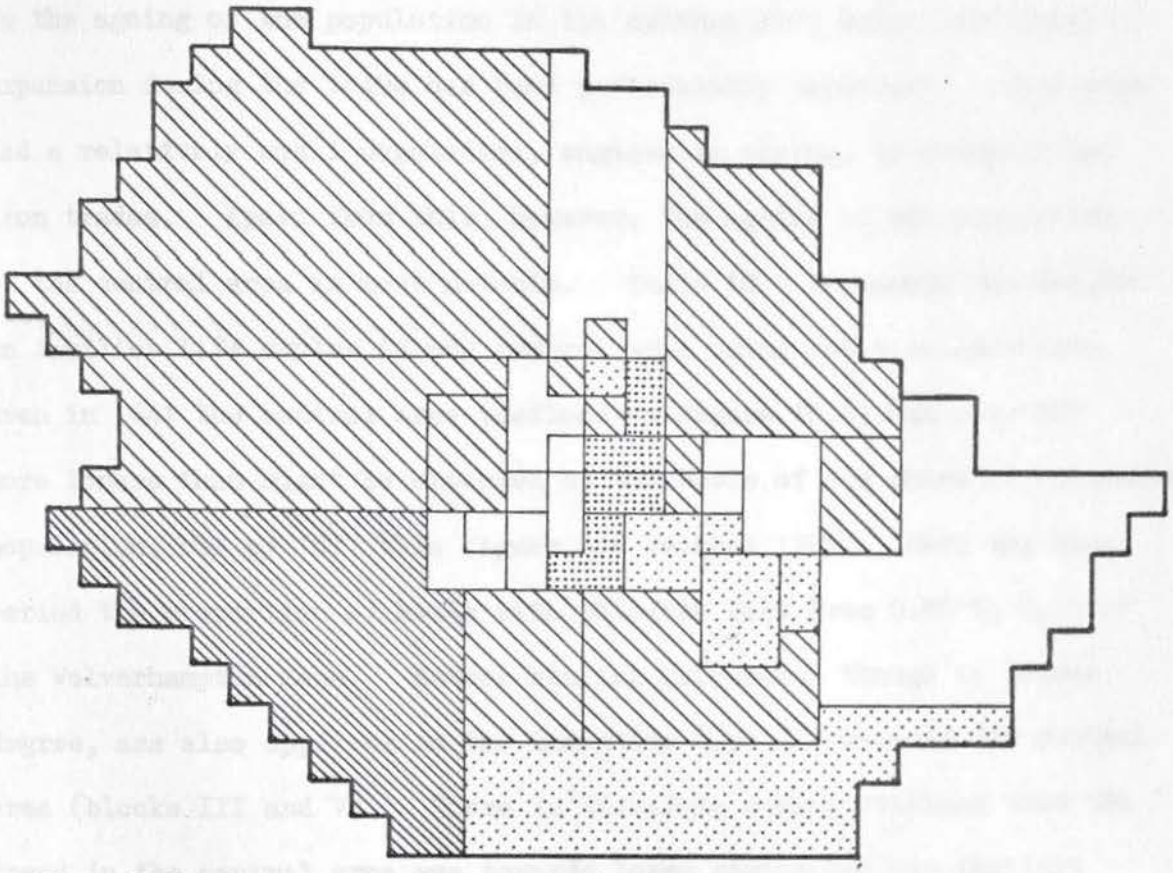
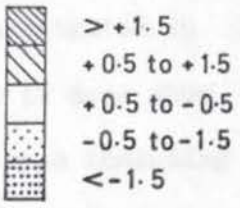


Figure 10·6 : Component Scores : Change 61-71 : Component I



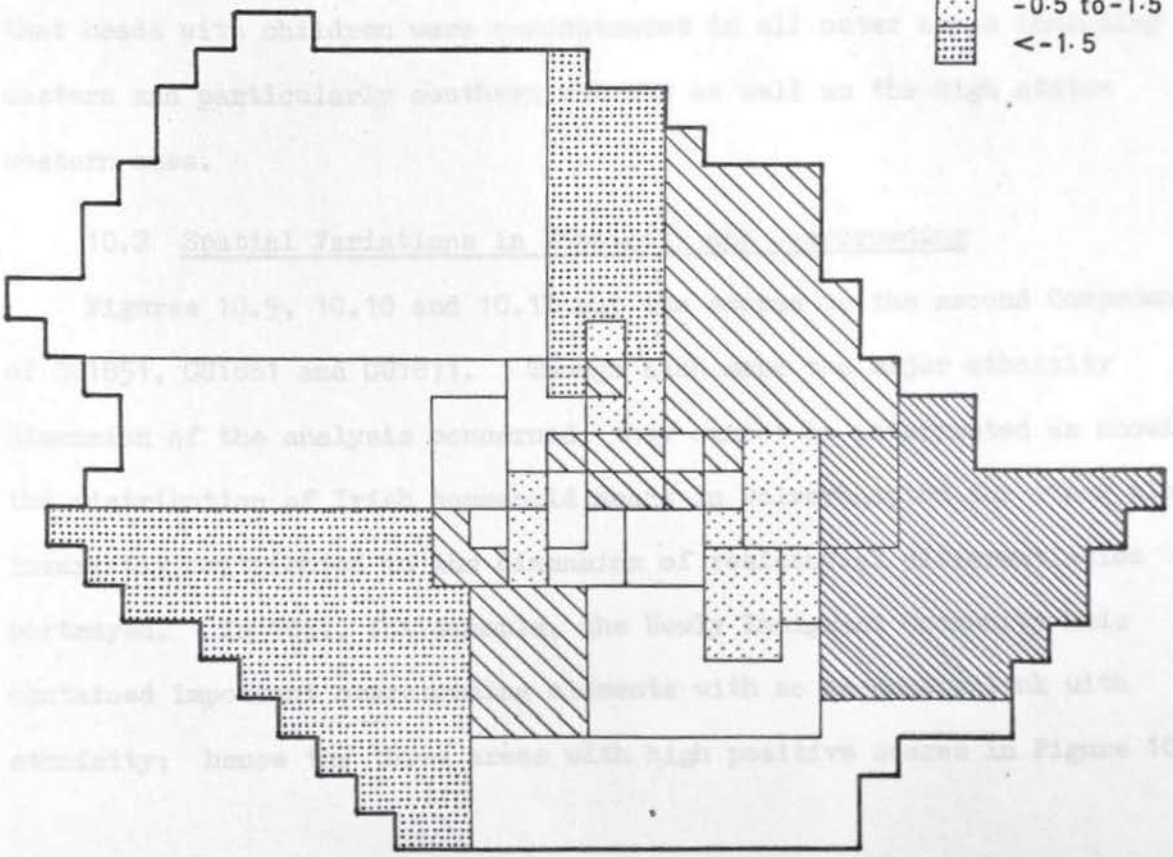


Figure 10·7 : Component Scores : Change 61-71 : Component III

is the ageing of the population in the extreme east where industrial expansion during the 1840s had been particularly important. This area had a relatively small population, engaged in mining, brickmaking and iron trades. Apart from this, however, the ageing of the population of the central area is most notable. Table 10.1 documents the decline in familist life styles in the central area using location quotients. Even in 1841 the central area (defined in Figure 10.8) had over 50% more loners than might be expected on the basis of its share of Wolverhampton population, but by 1871 this figure had reached 120%. Over the same period the proportion of heads with children fell from 0.86 to 0.75 of the Wolverhampton mean. Rather similar processes, though in lesser degree, are also apparent to the immediate east and west of the central area (blocks III and V). There is therefore strong evidence that the trend in the central area was towards lower status and non-familist household patterns. Figures 10.6 and 10.7 suggest that high status and younger age structures were becoming increasingly concentrated in the west. Whilst Table 10.1 does not conflict with this it does show that heads with children were concentrated in all outer areas including eastern and particularly southern suburbs as well as the high status western ones.

10.2 Spatial Variations in Ethnicity and Overcrowding

Figures 10.9, 10.10 and 10.11 map the scores on the second Components of GU1851, GU1861 and GU1871. Though each maps the major ethnicity dimension of the analysis concerned, they cannot be interpreted as showing the distribution of Irish household heads in Wolverhampton for other elements invariably contributed to the dimension of residential differentiation portrayed. In 1851, for example, the Newly Immigrant Community axis contained important overcrowding elements with no necessary link with ethnicity; hence the three areas with high positive scores in Figure 10.9

Table 10.1 Location Quotients for Loners and Heads' Children 1841-1871

	Location Quotients for Loners				Location Quotients for Heads' Children			
Block	1841	1851	1861	1871	1841	1851	1861	1871
I	1.18	1.25	0.98	1.11	0.87	0.79	0.98	0.97
II	1.52	1.78	2.23	2.20	0.86	0.87	0.79	0.75
III	0.74	0.76	0.91	0.82	1.09	1.09	0.99	0.98
IV	0.88	0.74	0.81	0.64	1.09	1.16	1.06	1.04
V	1.01	1.21	1.28	1.32	0.93	0.92	0.96	0.90
VI	0.75	0.57	0.65	0.63	1.10	1.17	1.03	1.08
VII	0.89	0.75	0.69	0.79	1.03	1.08	1.00	1.03
VIII	0.83	0.49	0.63	0.57	1.20	1.14	1.19	1.11
IX	0.94	1.35	1.06	1.30	0.92	0.91	0.95	1.03
(n)	(1140)	(1375)	(1300)	(1199)	(2659)	(4036)	(5551)	(6280)

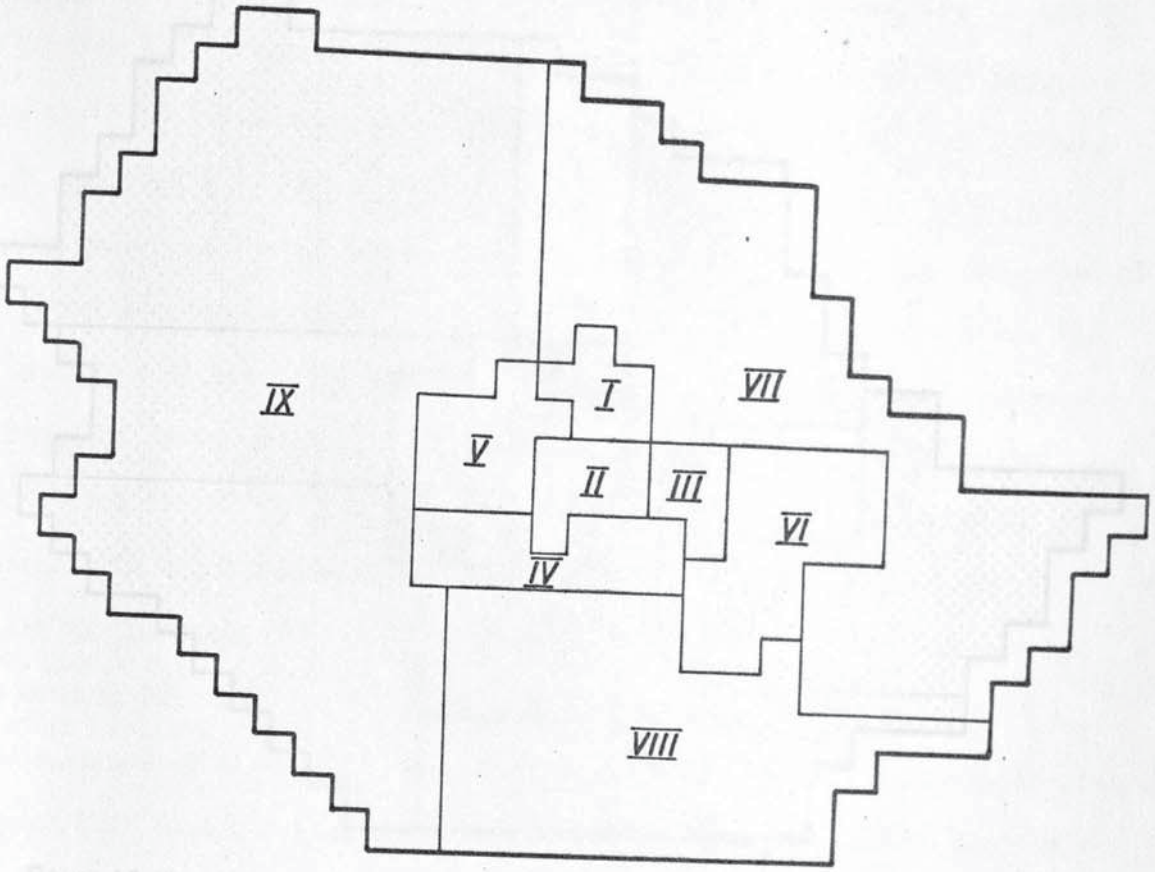


Figure 10-8: Blocks of Grid Units for which Location Quotients were Calculated

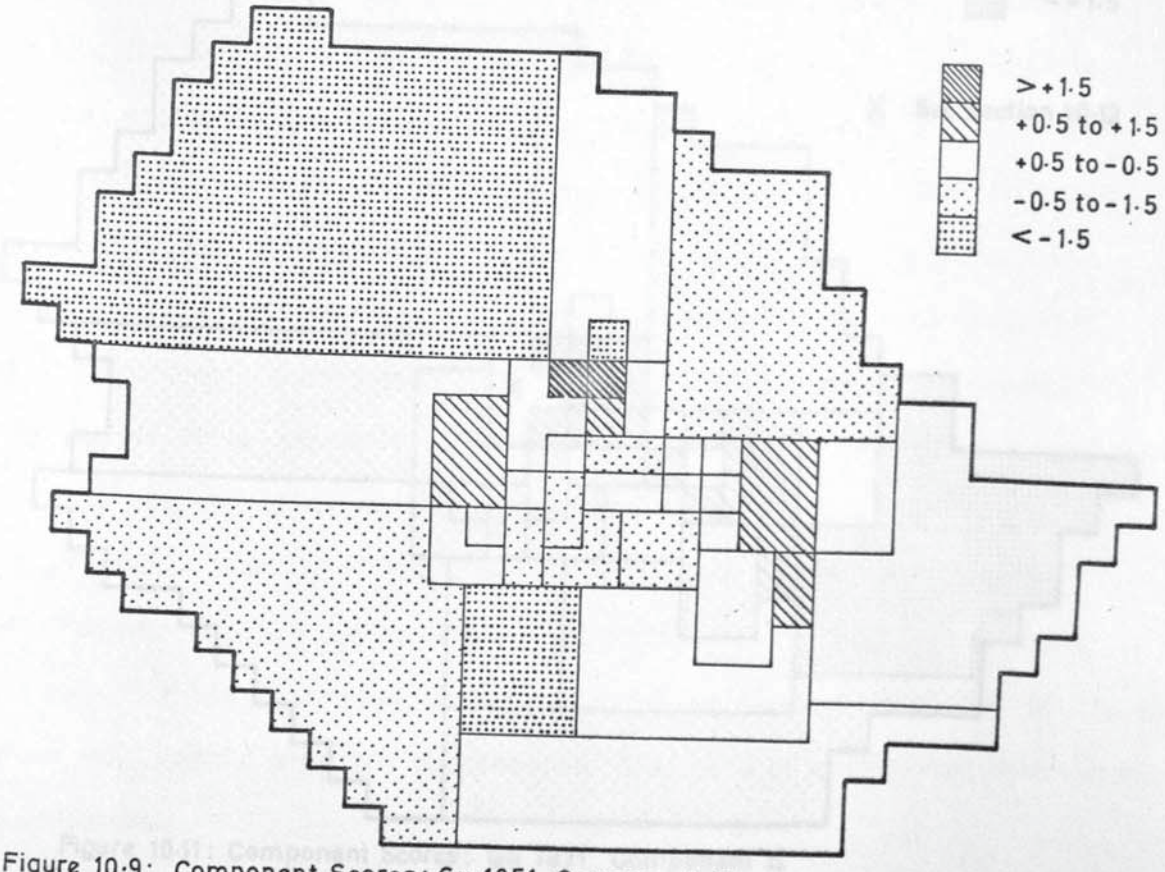


Figure 10·9: Component Scores: Gu 1851 Component II

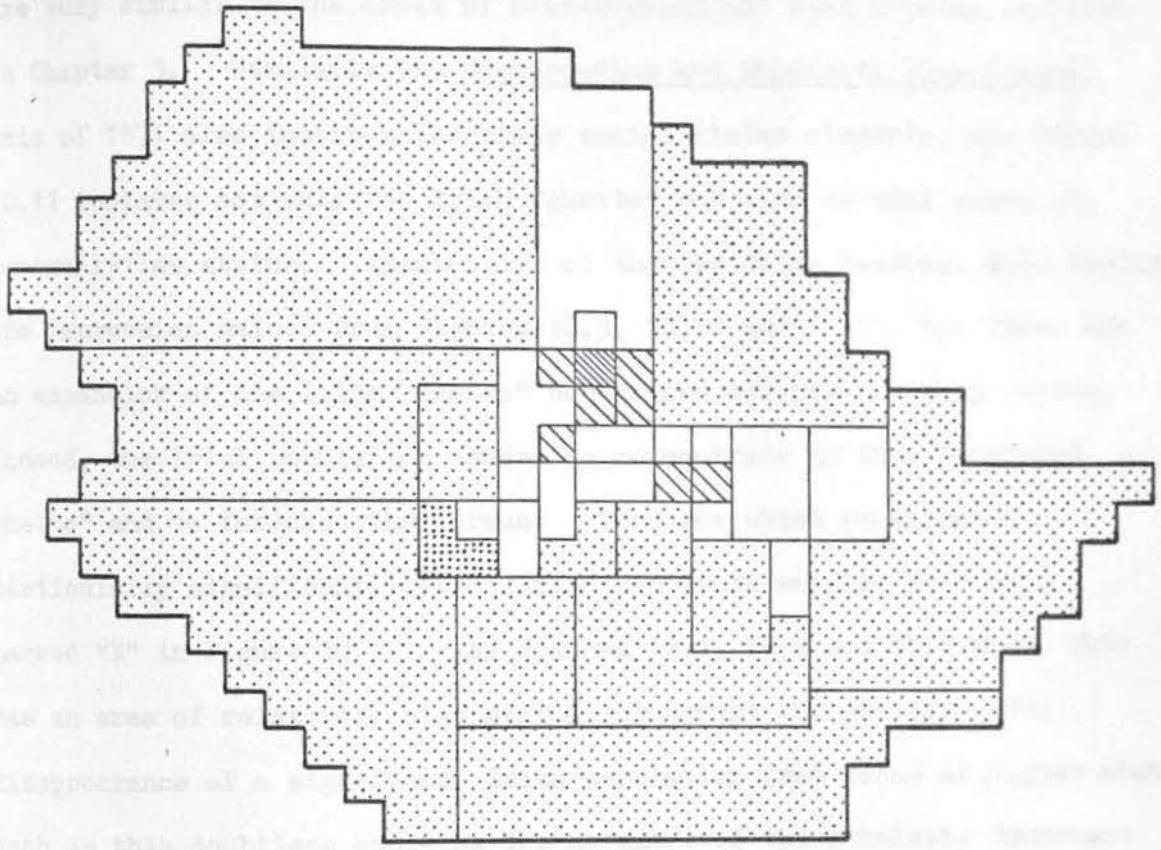


Figure 10·10: Component Scores: Gu 1861 Component II

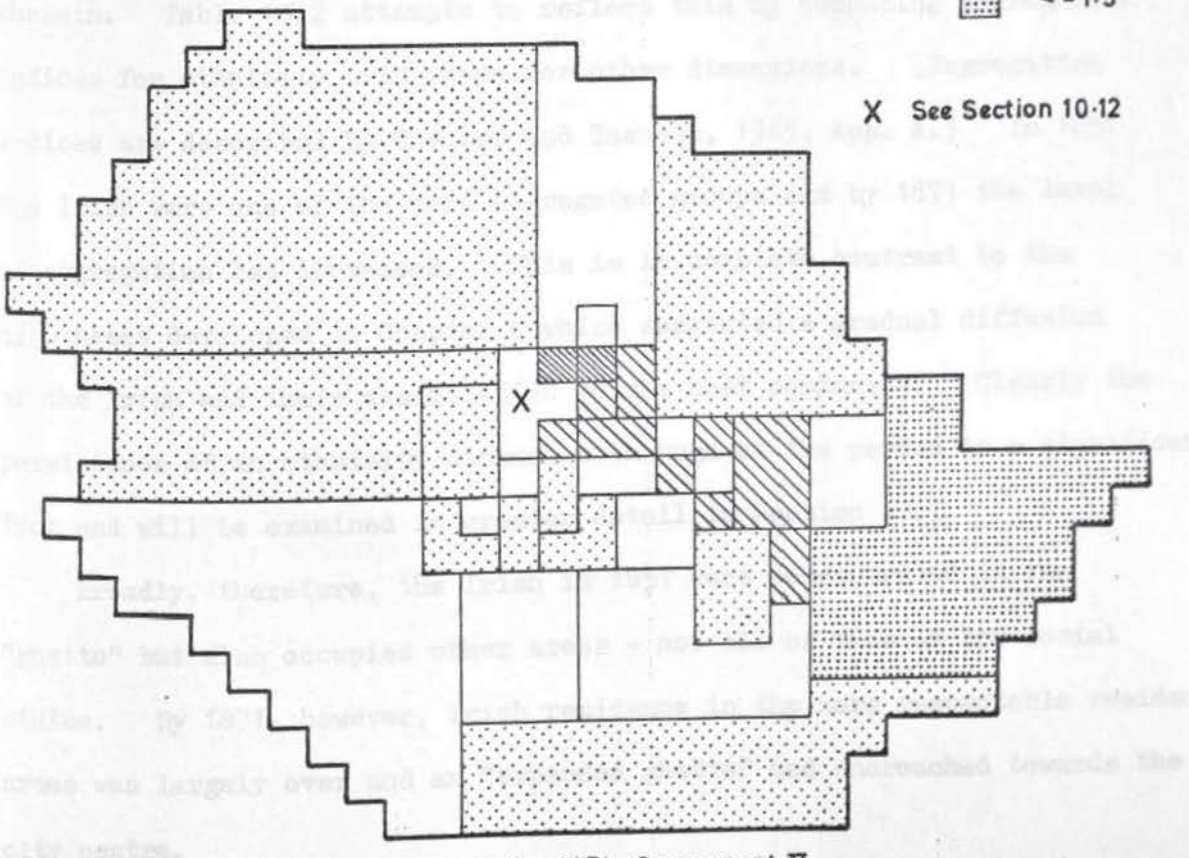


Figure 10·11: Component Scores: Gu 1871 Component II

are very similar to the areas of overcrowding and poor housing isolated in Chapter 3. Similarly the Overcrowding and Ethnicity (Low Status) axis of 1871 also incorporates clear social status elements, and Figure 10.11 isolates not only the Irish "ghetto" but also several areas of generally low status. Examination of the raw data, however, does confirm one impression gained from Figures 10.9, 10.10 and 10.11, for there was an expansion of the Irish "ghetto" southwards towards the city centre. Indeed, the Irish population tended to concentrate in this "expanded ghetto" and to forsake other areas. One area which experienced a particularly significant loss of Irish residents was the grid unit marked "X" in Figure 10.11. As Figures 10.1, 10.2 and 10.4 show, this was an area of relatively high status throughout the period. The disappearance of a significant Irish population from areas of higher status such as this doubtless explains the movement of the ethnicity Component of 1871 towards a more general social status axis. The trend throughout the period 1851 to 1871 was one of concentration as well as of expansion; the "ghetto" expanded but an increasing proportion of the Irish lived therein. Table 10.2 attempts to reflect this by comparing segregation indices for ethnicity with those for other dimensions. (Segregation indices are described by Taeuber and Taeuber, 1965, App. A.) In 1851 the Irish were one of the more segregated groups and by 1871 the level of segregation had increased. This is in complete contrast to the hypotheses developed in Chapter 2 which suggested a gradual diffusion of the Irish and their assimilation to the host community. Clearly the persistence of an ethnicity dimension throughout the period is a significant fact and will be examined in greater detail in Section 10.2.

Broadly, therefore, the Irish in 1851 were concentrated in the "ghetto" but also occupied other areas - not all of them of low social status. By 1871, however, Irish residence in the more respectable residentia areas was largely over and an "expanded ghetto" had encroached towards the city centre.

Table 10.2 Residential Segregation: Wolverhampton 1851-1871

Type of Segregation	Segregation Indices (Based on Grid Unit Data)			
Segregation of Birthplace Groups	(1841)	1851	1861	1871
West Midlands Counties (incl. Staffordshire		4.68	5.79	5.83
Rest of England and Wales		17.34	18.73	21.35
Others (mainly Irish)	(50.08)	37.16	39.99	41.02
Segregation of Social Classes				
Classes I and II		33.76	28.25	31.78
Class III		5.85	5.94	6.27
Classes IV and V		11.83	9.91	10.55
Segregation of Occupational Groups				
Agriculture		52.59	52.91	46.77
Mining		53.64	58.30	60.81
Building		23.75	23.48	22.42
Manufacture		9.81	10.96	10.74
Transport		28.20	30.00	37.82
Dealing		30.73	27.40	21.45
Industrial Service		24.08	29.69	18.37
Public Service and Professional		39.33	31.97	35.42
Domestic Service		24.72	24.35	24.78
Property Owning and Independent		48.29	29.96	38.80
Dependent		3.41	3.25	3.43
(Locks)		(42.87)	(38.41)	(38.24)

10.13 Social Patterns and the Quality of the Residential Environment: Inter-System Congruence

It was argued in Chapter 3 that, in 1871, the area to the west of Wolverhampton was probably the most environmentally attractive part of the town. Housing in the west was relatively newer, larger and more spaciously laid out than that in the centre or eastern areas. Moreover, unattractive neighbouring land uses such as industry and mining were largely absent. By contrast the centre was more densely populated, had more industrial uses and had numerous courts of poor housing behind the main facades. The east fared worst of all with older, smaller houses and concentrations of heavy industry around the railways and canals. Whereas open agricultural land lay to the west of Wolverhampton, the land to the east and south east was disfigured by disused coal mines, claypits and ironstone workings.

But in 1871 the high status population lived in the town centre as well as in the western suburbs. To some extent, therefore, there appears to have been incongruence between social and environmental patterns. It seems likely that much of this incongruence was sustained by alternative, more functional relationships. The cost of a new suburban home, the cost of moving from the centre to that home and the cost of daily travel back into the centre to work were probably considerable - particularly before an adequate public transport system developed. For some, these additional costs outweighed the environmental benefits of relocation and even as commercial land values in the central area rose the net benefits may have remained below the total cost. In addition, where the incongruence was truly dysfunctional in that the costs of movement were much less than the potential benefits, there were frictional forces tending to maintain the old pattern. An individual trader might continue to live in the centre because his own business did not require additional space or because he did not wish to face the physical upheaval of moving house; inertia

would therefore maintain the status quo despite the higher value of central sites. Further, movement was a long term investment which, in the short term, many traders might be unable to afford. So long as it was cheaper in the short term to remain in the centre such traders would be forced to forego potential longer term benefits.

Nevertheless the direction of change was towards a congruence between social and environmental patterns: the higher status groups were increasingly leaving the centre of Wolverhampton for the western suburbs. It is reasonable to suggest that a measure on incongruence between their social pretentions and their environmental conditions was perceived by the upper status groups and that this increasingly fostered a desire to move. Rising central land values, increasing personal profits and improved transport facilities may have gradually provided the means whereby this movement could take place.

Incongruence between the environmental and social systems extended to the family status dimension too. Though Figure 10.3 suggests that the younger population generally occupied suburban areas the benefit this bestowed is in some doubt. If the east and south east of Wolverhampton was environmentally unattractive, as Chapter 3 argues, with an excess of industry and with small, inferior houses then it can hardly be construed as the ideal place to raise children. It is debatable whether the urban poor of nineteenth century Wolverhampton perceived the incongruence between their residential environment and familist life styles - certainly the poor were willing to move to attractive suburban homes once transport improvements and council housing made this possible. But in 1871 this option was not open to them, and it was the dealing community - which had long formed an older, more feminist and less familist group - that was taking particular advantage of residence in the better western suburbs. Table 10.2 documents the decline in the segregation of the dealing community

from the population at large as this took place. Though families were leaving the central area, therefore, the poorest families tended to remain. Figure 10.3 confirms that much of the city centre lacked a markedly older population. The need for suburban residence was greatest amongst the poorer families in the central area but high status dealing families (with their older age structure and servants) were most able to move. Table 10.1 confirms that the proportion of heads with children declined only slowly in the city centre between 1841 and 1871. This incongruence was perpetuated by the presence of cheap slum properties very close to the centre. Here the poor could live cheaply and without journey to work costs. Substantially improved housing was not made available to these disadvantaged groups until local authority housing schemes began; it was to take decades of political pressure before substantial progress could be made.

10.2 Individual Relationships And The Dimensions Of Residential Differentiation

In view of the impossibility of inferring individual from ecological correlations the possibility of obtaining the former directly from the Enumerators' Returns constitutes a very real advantage of the data used. For whereas ecological correlations may describe the evolving residential pattern, it is only by examining individual relationships that these changes can be fully understood. The present Section examines relationships at an individual level in connection with two important issues. First the temporal changes in the ethnicity dimension are considered in an attempt to explain the continued importance of such an axis when some assimilation might be expected. Secondly the precise relationship between social class and household complexity is examined to allow the hypotheses advanced in Chapter 2 to be tested against empirical observation. It might be that, although a composite social status/household complexity axis was replaced by separate socio-economic and family status dimensions, the mechanisms were totally different from those proposed.

10.21 The Irish Question

In Chapter 8 it became clear that the ethnicity dimension, by which areas with a very substantial Irish immigrant population were distinguished from the rest of the city, did not decline in importance throughout the period 1851 to 1871. It is true that the ethnicity dimension moved closer towards a more general social status axis but this movement does not appear to have been part of a trend towards assimilation. In 1871 the number of Irish household heads had declined considerably from the peak represented by the 1861 census: in the 10% sample data there were 155 Irish heads in 1851, 257 in 1861 but only 196 in 1871. This decline was most marked in the relatively higher status areas in which an Irish population had formerly lived, so that relative concentration occurred in the "ghetto". Furthermore, the "ghetto" area expanded southward into the northern fringes of the commercial centre. The net effect of these changes was slightly to increase the segregation of the Irish from the rest of the population, as Table 10.2 shows. Despite this, however, it was demonstrated that the Irish immigrants became more like the host community in that the excessive maleness, the lack of young children, and high male activity rates disappeared.

It is instructive to examine relationships at an individual level for this sheds considerable light on the changes which occurred. Comparison of Tables 10.3 and 10.4 shows that whereas, in 1851, Irish-born heads with 1, 2 or 3 children were proportionately over-represented compared with all heads, in 1861 it was Irish heads with 3, 4 or 5 children that were over-represented. Clearly household heads were not representative of the overall pattern - particularly amongst the Irish with high levels of multiple occupancy and many loners - but a movement towards more normal family patterns is nevertheless apparent. Tables 10.5 and 10.6 document a further aspect of this process of "normalization", comparing the

Table 10.3 Birthplace and Number of Children: Wolverhampton 1851

1851	Number of Children per Household by Birthplace of the Head (%)											
Birthplace	0	1	2	3	4	5	6	7	8	9+	Total %	(n)
Staffordshire	26.82	16.73	18.65	12.80	10.89	7.06	3.73	2.42	0.60	0.30	100.00	(992)
Other West Midland Counties	24.90	20.27	18.34	14.87	10.62	5.02	4.05	1.16	0.58	0.19	100.00	(518)
Rest of England and Wales	26.61	22.74	17.60	11.16	9.44	6.87	3.43	0.86	0.43	0.86	100.00	(233)
Others (mainly Irish)	25.80	22.58	20.00	12.26	10.97	5.16	3.23	0.00	0.00	0.00	100.00	(155)
Total - All Birthplaces	26.18	18.91	18.55	13.12	10.64	6.32	3.74	1.69	0.53	0.32	100.00	(1898)

Table 10.4 Birthplace and Number of Children: Wolverhampton 1861

Birthplace	Number of Children per Household by Birthplace of the Head (%)											
	0	1	2	3	4	5	6	7	8	9+	Total %	(n)
Staffordshire	23.70	18.91	17.02	14.20	12.06	7.10	3.42	1.88	1.20	0.51	100.00	(1169)
Other West Midland Counties	23.81	17.57	18.88	15.93	7.88	7.88	5.58	1.81	0.66	0.00	100.00	(609)
Rest of England and Wales	26.07	16.13	18.01	16.13	11.02	6.45	2.96	1.61	0.81	0.81	100.00	(372)
Others (mainly Irish)	19.07	15.95	17.51	22.18	10.89	8.56	3.89	1.17	0.78	0.00	100.00	(257)
Total - All Birthplaces	23.60	17.82	17.70	15.79	10.72	7.35	3.95	1.74	0.96	0.37	100.00	(2407)

Table 10.5 Birthplace and Multiple Occupancy: Wolverhampton 1851

Birthplace	All Heads		Heads of Household to Family Nuclei	
	n	%	n	%
Staffordshire	992	52.26	128	38.91
Other West Midland Counties	518	27.29	66	20.66
Rest of England and Wales	233	12.28	25	7.60
Others (mainly Irish)	155	8.17	110	33.43
Total - All Birthplaces	1898	100.00	329	100.00

Table 10.6 Birthplace and Multiple Occupancy: Wolverhampton 1871

Birthplace	All Heads		Heads of Household to Family Nuclei	
	n	%	n	%
Staffordshire	1437	53.26	143	52.57
Other West Midland Counties	612	22.68	56	20.59
Rest of England and Wales	453	16.79	37	13.60
Others (mainly Irish)	196	7.27	36	13.24
Total - All Birthplaces	2698	100.00	272	100.00

birthplace distribution of all household heads with that of the household heads in whose households each family nucleus occurred. In 1851 the proportion of family nuclei with Irish-born household heads was over four times the proportion of all households with Irish-born heads. By 1871 the proportions differed by a factor of less than two, and the general level of multiple occupancy had declined too. Another aspect of the decline in multiple occupancy is seen in Tables 10.7 and 10.8. In 1851 a very much higher proportion of Irish households contained 6, 7, 8 or 9+ non-kin than did all households; by 1871 Irish households had moved far closer to the norm. There can be little doubt, therefore, that the decline of "newly immigrant community" characteristics, suggested in changing component loadings, operated at the individual level. No distortion or spurious change was introduced by reliance upon ecological data.

Perhaps most intriguing of all is the relationship between ethnicity and social status between 1851 and 1871, for at an ecological level there appears to have been an increase in the association between ethnic minoriti and low status. Part of this change has already been attributed to the decline of Irish groups formerly resident in relatively high status areas and to their concentration around the "ghetto", but it is interesting to examine the extent to which changes at the individual level were also involved. Tables 10.9, 10.10 and 10.11 confirm that, throughout the period, the Irish were under-represented in the higher social classes and over-represented in classes IV and V. Individual as well as ecological data confirm the continuing disadvantage of the Irish in employment. Descrimination may have played some part in this, especially since the Irish gained a reputation for laziness and unreliability, but perhaps the most likely explanation is the lack of education of many of the Irish. Comparison of Tables 10.9, 10.10 and 10.11 shows that not only were the

Table 10.7 Birthplace and Non-kin: Wolverhampton 1851

Birthplace	Number of Non-kin per Household by Birthplace of the Head (%)											
	0	1	2	3	4	5	6	7	8	9+	Total %	(n)
Staffordshire	58.77	18.45	10.48	5.65	2.82	1.82	1.11	0.30	0.20	0.40	100.00	(992)
Other West Midland Counties	55.02	23.75	10.42	4.63	2.32	1.54	0.77	0.58	0.00	0.97	100.00	(518)
Rest of England and Wales	52.36	24.46	9.87	6.87	3.00	1.29	1.29	0.43	0.00	0.43	100.00	(233)
Others (mainly Irish)	36.77	12.90	7.10	9.68	4.52	3.87	5.16	2.58	3.87	13.55	100.00	(155)
Total - All Birthplaces	55.16	20.18	10.12	5.85	2.85	1.84	1.37	0.58	0.42	1.63	100.00	(1898)

Table 10.8 Birthplace and Non-kin: Wolverhampton 1871

Birthplace	Number of Non-kin per Household by Birthplace of the Head (%)											
	0	1	2	3	4	5	6	7	8	9+	Total %	(n)
Staffordshire	69.87	17.40	6.68	2.78	1.25	0.97	0.35	0.28	0.07	0.35	100.00	(1437)
Other West Midland Counties	68.47	16.18	7.52	3.27	2.12	1.14	0.65	0.16	0.00	0.49	100.00	(612)
Rest of England and Wales	61.81	21.41	9.94	4.20	0.88	0.88	0.66	0.00	0.00	0.22	100.00	(453)
Others (mainly Irish)	64.29	13.27	8.16	4.08	4.08	3.06	1.02	1.02	0.51	0.51	100.00	(196)
Total - All Birthplaces	67.79	17.50	7.52	3.23	1.59	1.15	0.52	0.26	0.07	0.37	100.00	(2698)

Irish at a continued disadvantage, but that the degree of disadvantage was greater in 1871 than it had been in 1861.

This conclusion is surprising, for even if the process of assimilati was far slower than has been suggested (see Chapter 2), there is no reaso to expect an actual deterioration in the position of the Irish. It will be noted from Table 10.11 that the proportionate disadvantage of the Irish in 1871 was marked by unexpectedly small numbers in classes I and II and in class III when compared with changes over the period 1851-61 (Tables 10.9 and 10.10). But the period 1861-71 was one of declining Irish populations and, as has already been demonstrated (Section 10.1), the departure of the Irish from areas of relatively high status was particular important. Assuming that, in 1851 and 1861, the Irish in classes I, II and III tended to live, not in the "ghetto" but in higher status areas, their departure from Wolverhampton would explain both the fall in the numbers of Irish in higher status groups and the fall in the numbers in higher status areas. Examination of the raw data reveals such a trend between 1861 and 1871, though another process was also at work. The evidence suggests that not only did high status Irish heads in relatively high status areas tend to leave Wolverhampton altogether, but also that such higher status heads as remained tended to concentrate nearer to the "ghetto". The fringe of the city centre appears to have been particularly important in this respect - presumably because it contained houses once occupied by native higher status groups.

The two processes - differential out-migration of the higher status Irish living in better areas, and concentration on the fringe of the "ghetto" - were viewed with some suspicion. It was felt, for example, that those Irish household heads who attained sufficient standing in the town to live in higher status areas and to fall into classes I or II might try to conceal their Irish origins. No evidence of this was found

Table 10.9 Social Class by Birthplace: Wolverhampton Household Heads, 1851

1851	Social Class of Household Heads (Total All Birthplaces = 100)				
Birthplace	I & II	III	IV & V	X*	(n)
Staffordshire	106	106	83	100	(992)
Other West Midland Counties	77	104	107	83	(518)
Rest of England and Wales	146	84	105	82	(233)
Others (mainly Irish)	66	69	180	184	(155)
Total All Birthplaces %	16.7	55.0	26.2	2.1	(1898)

* Sample sizes very small

Table 10.10 Social Class by Birthplace: Wolverhampton Household Heads, 1861

1851	Social Class of Household Heads (Total All Birthplaces = 100)				
Birthplace	I & II	III	IV & V	X*	(n)
Staffordshire	108	105	85	109	(1169)
Other West Midland Counties	94	101	99	109	(609)
Rest of England and Wales	110	107	84	84	(372)
Others (mainly Irish)	64	64	195	64	(257)
Total All Birthplaces %	12.8	54.6	27.2	5.4	(2407)

* Sample sizes small

Table 10.11 Social Class by Birthplace: Wolverhampton Household Heads, 1871

1871	Social Class of Household Heads (Total All Birthplaces = 100)				
Birthplace	I & II	III	IV & V	X*	(n)
Staffordshire	97	108	93	92	(1437)
Other West Midland Counties	82	100	106	105	(612)
Rest of England and Wales	156	99	76	104	(453)
Others (mainly Irish)	54	55	191	136	(196)
Total All Birthplaces %	13.3	50.6	27.3	6.4	(2698)

* Sample sizes very small

in the census returns, for apparently Irish christian and surnames were complemented by an Irish birthplace. Clearly, effective deception would require a change of name too and this would not be detected. It seems unlikely that anyone would need to go to such great lengths. Since the 1851 and 1861 Censuses revealed significant numbers of the Irish in higher status occupations no deception was thought necessary even when contemporary evidence suggests that anti-Irish feeling was at its peak. Explanation of the exodus of higher status Irish is more difficult, but a movement in search of better opportunities in London, or elsewhere, is one possibility.

Individual data do therefore provide strong evidence for a decline in the higher status Irish community and also for the concentration of those who remained towards the "ghetto"/city centre fringe area. This dual trend conforms very neatly with the movement of the ethnicity axis towards a more general social status dimension as suggested in Chapter 8 and with the concentration towards an "expanding ghetto" as proposed in Section 10.1.

10.22 Social Status and Household Complexity

In Chapter 2 it was suggested that, during the early industrializing phase, household complexity was greatest amongst the higher status groups who were occupied in dealing and trade which was still domestically organized. The households of these groups would contain the head's nuclear family, relatives, servants and employees whilst lower status households would be unlikely to contain servants or employees but might include lodgers. Table 10.12 supports this assertion. In 1851, high status households (classes I and II) were much larger than average; households of the respectable middle ground (class III), with few lodgers and few servants or employees, were very small; and low status households (classes IV and V), with many lodgers, were rather larger. It was

Table 10.12 Social Class and Non-kin: Wolverhampton 1851

Social Class	Number of Non-kin per Household by Social Class of the Head (%)												
	Mean	0	1	2	3	4	5	6	7	8	9+	Total %	(n)
I and II	1.758	24.53	31.13	18.87	10.06	7.23	4.72	1.89	0.63	0.00	0.94	100.00	(318)
III	0.882	63.18	17.83	8.05	4.51	1.44	1.25	1.25	0.48	0.19	1.82	100.00	(1043)
IV and V	1.099	58.14	17.51	8.85	6.04	3.02	1.41	1.21	0.80	1.21	1.81	100.00	(497)
X	0.875	52.50	27.50	10.00	5.00	2.50	0.00	2.50	0.00	0.00	0.00	100.00	(40)
Total - All Classes	1.089	55.16	20.18	10.12	5.85	2.85	1.84	1.37	0.58	0.42	1.63	100.00	(1898)

further argued that a decline in the complexity of high status households occurred during industrialization when high status groups began to leave the city centre for the suburbs: high status households then tended to contain fewer employees. As households of differing status moved towards similar levels of complexity and as the nuclear family became dominant so socio-economic and family status emerged as separate dimensions of residential differentiation.

The movement of higher status groups from the city centre has already been described. Table 10.13 examines changes in household complexity by social class between 1851 and 1871. The proportion of households which, in addition to the head, contained his/her nuclear family, more distant relatives, servants and remaining non-kin are shown for each status group. In addition, a complexity index is presented. This is simply the total number of household elements (nuclear families, extensions etc.) divided by the total number of households. If each household had all four elements the maximum value of 4.0 would be achieved. The index thus measures the extent to which each status group departs from this high degree of complexity.

Employees, where present, were used to define classes I and II and so were not collected as a variable for the analysis. But the "remainder" was largely composed of employees and lodgers and may serve a similar function since lodgers were prominent only amongst the lower status groups. Table 10.13 shows that the complexity of households in each status group declined between 1851 and 1871, and that this was largely due to the declining proportion of households containing "remainders". In the high status groups this was no less marked than amongst the low status households yet the latter lost many lodgers as overcrowding was reduced; high status groups must therefore have experienced a decline in the numbers of employees. The arrangement of the returns did not allow this process

Table 10.13 Household Complexity by Social Class: 1851-1871

Social Class	Date	Households (%) Containing the Elements Shown, by Social Class of the Head					
		Nuclear Family	Extension	Servants	Remainder	(n)	Complexity Index
I and II	1851	82.08	24.21	60.69	40.25	(318)	2.072
	1861	83.06	28.34	68.41	38.76	(307)	2.186
	1871	83.01	26.74	60.72	23.68	(359)	1.942
III	1851	94.34	18.41	9.59	30.68	(1043)	1.530
	1861	94.52	14.24	5.79	25.82	(1313)	1.404
	1871	95.38	15.53	6.15	20.73	(1365)	1.378
IV and V	1851	93.36	17.30	3.42	39.44	(497)	1.535
	1861	94.97	13.72	2.44	28.05	(656)	1.392
	1871	93.02	14.96	1.62	23.44	(802)	1.330
All Classes	1851	91.62	19.13	16.65	34.62	(1898)	1.620
(incl. X)	1861	92.27	16.24	13.34	28.83	(2407)	1.507
	1871	91.96	17.38	12.42	22.65	(2698)	1.444

to be traced for individual households, but the proportion of high status households containing a "remainder" was found to be much lower in the western suburbs than in the city centre. Though this was true for 1851 and for 1871 it is clear that the total numbers involved were different at the two dates and that in 1851 a higher proportion of high status households lived in the city centre and conformed with its high complexity norm than was the case in 1871. At the later date more of the high status households lived in the suburbs and conformed to the lower complexity pattern dominant there.

Hence changes of the type hypothesized in Chapter 2 do seem to have accompanied the replacement of a composite social status/household complexity dimension by independent socio-economic and family status axis. It must be emphasized, however, that this process began long before 1851 (in fact before 1841) and continued until well after 1871; in the strictest sense household complexity did not reach similar levels for all classes until after the decline of domestic service.

10.23 Conclusion: Individual Relationships and Dimensions of Differentiation

Both of the foregoing analyses of individual relationships have proved useful in explaining temporal changes in the dimensions of residential differentiation as revealed by factorial ecologies. It is unfortunate that so many studies have to rely upon ecological data alone since many of the explanations of important patterns are stated in terms of individual relationships about which the available data are silent. The present analysis has certainly benefitted from the individual data furnished by the Enumerators' Returns and a better understanding of the evolving residential system bears witness to this fact.

10.3 Overview: Changing Patterns of Residential Differentiation - Wolverhampton 1851-71

In 1851 the major axis of residential differentiation within Wolverhampton was a composite social status/household complexity dimension. The major feature which this dimension describes is the contrast, at grid unit scale, between the town centre and the remainder of the urban area. The former were dominated by high status households, many of them engaged in domestically organized dealing activities. Such households were relatively complex including the head, his nuclear family, relatives, servants and employees; even in 1851, however, the nuclear family was becoming less important and households containing children of the head were therefore under-represented in the city centre. By contrast, households in the rest of the city were less complex, being characterized by fewer non-kin and more children, and were of lower social status. At this time ethnicity formed a second dimension of residential differentiation distinguishing between a relatively compact Irish "ghetto" area with gross overcrowding and the remainder of the town. The "ghetto" was characterized by an absence of females, of children and the elderly and also of the Wolverhampton born; multiple occupancy was rife and both non-kin and loners were numerically important. Though the Irish in the "ghetto" were of low social status, there were Irish households of higher status in rather better residential neighbourhoods so that the overcrowding/ethnicity dimension was linked with the presence or absence of "newly immigrant community characteristics" rather than pure status differences.

Between 1851 and 1871 the high status population tended to leave the central area for the suburbs. In moving to the suburbs the high status household conformed with the dominant complexity patterns there by leaving employees behind in the city centre. Hence managers were increasingly placed in city centre businesses where they were recorded as household heads; their fellow employees were often the only other members of the

household and non-kin (particularly loners) became increasingly important. During the same period the Irish high status population tended to disappear from the better residential areas whilst the "ghetto" expanded. Some of the higher status Irish households undoubtedly left Wolverhampton, but others increasingly concentrated in the area lying between the "ghetto" and the city centre. In this way the "ghetto" tended to expand southward. Meanwhile the characteristics of recent immigration faded as the Irish men married or brought their wives to Wolverhampton. Children became more numerous so correcting the earlier lack of locally born individuals. In employment, however, the Irish fared rather poorly and continued to occupy low status positions.

By 1871 therefore the major dimension of residential differentiation with Wolverhampton was a family status axis distinguishing areas of old age structures, few children and complex households from areas with young age structures, many children and simpler households. The former were characterized by high female headship and activity rates, the latter by low female headship and activity rates but much higher fertility levels. Part of the city centre conformed to the former pattern with an old age structure, few children, complex households and high female headship and activity rates. At grid unit scale, however, the loss of children and of "normal" families was not sufficiently marked for the whole of the central area to be dominated by this extreme type. This was because many low status households, living in poor property behind mainstreet frontages, were unable to afford to leave the city centre for more attractive suburban areas. "Normal" families were not, therefore, completely lacking. Though the status of the city centre declined, by 1871 it was still of relatively high status; the western suburbs were, however, of growing importance and it was there that the largest high status population lived. Social status formed a third dimension of residential differentiation,

having become dissociated from elements of family status differences. Ethnicity and overcrowding continued to form the second axis differentiating between Wolverhampton's residential neighbourhoods, but the higher status Irish population had largely disappeared from better residential areas and a high proportion of Irish-born household heads was now virtually synonymous with low socio-economic status. Though there was little or no sign of assimilation the exaggerated population characteristics of the newly immigrant community were absent and the "ghetto" had expanded towards the city centre.

An evolution of the dimensions of residential differentiation was clearly underway between 1851 and 1871, and continued beyond that period. One important feature to emerge from the foregoing description is of profound significance in this context. It has become clear that changing dimensions of residential differentiation implied and were reflected in changing spatial patterns so that neither a process-function nor a process-form approach could do full justice to the temporal changes observed. Only a complete form-function-process view permits a full understanding of the evolution of residential patterns during rapid industrialization and urban growth. Any lesser approach tells only a part of the story.

10.4 Reflections: Further Improvements

Perhaps the major limitation of all existing factorial ecologies is the inadequate treatment of spatial form. The earlier analysis, for example, relied upon data assembled into relatively coarse grid units and attempted to assess inter-system congruence at that level. As Michelson (1970) clearly shows, individual adjustments to environment occur at a much finer level than can be examined using aggregate data. The ideal approach based upon individual data from the Enumerators' Returns linked to individual data about house types derived from cartographic or rating sources may never be possible, but there are several ways in which existing procedures might be improved.

One of the most striking suggestions is provided by Simmons (1971) who argues that the models of Burgess and Hoyt explain population characteristics but are not necessarily relevant to land use (ibid., 129). To discover the dimensions of urban land uses and the spatial models to describe them he advocates factor analysis of a correlation matrix of different land use categories to derive independent axes of variation "that are applicable to all cities in the same manner as are the social dimensions" (ibid.). These land use dimensions will, Simmons claims, emerge more clearly if other aspects of land use (such as intensity, attractiveness and quality) are added to the data set.

> "Many, many other variables such as ownership pattern, traffic generation ability, age or period of development, and land values, as well as various potential measures of access to total population, daytime population or employment could be added to this general analysis. The broader the set of land use variables, the greater contribution to urban land use theory. Once the spatial pattern of each dimension is examined and specified, the whole problem of the relevance of models can be examined." (ibid., 131)

This type of approach appears to offer some answer to Michelson's criticism (1970, 14) of social area studies as too restrictively "social" in approach and based upon an inadequate conceptualization of environment to mean the "social environment" (ibid., 17). Moreover, Simmons realizes the possibilities when he asks "What are the relations between the dimensions of social variates and the dimensions of land use? ..... Are there certain dimensions of land use that are associated with the social symptoms of slums? Are there specific dimensions of land use which are incompatible with other dimensions?" (Simmons, 1971, 131). The technique of land use analysis based upon large scale maps, which was described in Chapter 3, may offer a means of implementing Simmons' recommendations, particularly if the same grid squares were used both for map analysis and for aggregation of census data.

If such an approach appears too ambitious, simpler methods may easily be devised. In towns where Enumerators give adequate address information,

street fronting properties might be aggregated into one set of areal units and all other properties into another. The extent of differences between these two groups of properties could then be examined in detail. In large cities, residential areas might be classified according to the period of development so that the evolution of suburbs of similar vintage might be examined in an approach analogous to cohort analysis. Similarly, units of landownership from pre-construction tythe maps might be adopted as an areal framework to assess the impact of different ownership upon the residential pattern.

Another major limitation of current techniques concerns the scale at which spatial patterns occur. Using individual data from the Enumerators' Returns and appropriate cartographic evidence it should be possible to tie each household to a unique grid reference in those towns where full addresses are given. It should then be possible to measure the homogeneity of areal units of different scales with respect to selected variables and so evolve a procedure permitting crude measurement of the scale of residential differentiation. If, as Dennis (1974, 6) suggests, the scale of residential differentiation rose through time, then a series of analyses might allow the importance of the development of public transport and the advent of council housing to be assessed.

Finally, once many analyses were available for towns of widely different sizes it should be possible to generalize about the effect of city size upon residential patterns. Schnore (1965, 371), Schnore and Varley (1955), and Bourne and Barber (1971) all agree that size has an important influence upon the degree of residential differentiation and upon the spatial patterns adopted. Sound empirical evidence for a period of rapid urban growth would encourage theoretical development in this area.

CHAPTER 11 CONCLUSIONS

In drawing together the main ideas of the foregoing analyses it is convenient to isolate four groups of findings for discussion in this the final Chapter. Section 11.1 evaluates the Enumerators' Returns and the way they were used to provide a standard variable list which would reflect residential patterns in nineteenth century Wolverhampton. Methodological issues are examined in Section 11.2 which considers the relative merits of alternative procedures and some of the limitations of the factorial approach. Section 11.3 describes the major empirical findings regarding the evolution of residential patterns during rapid urbanization and growth, devoting particular attention to general statements which allow an overall understanding of the temporal trends revealed. Finally, Section 11.4 offers signposts for future research into urban residential patterns.

11.1 The Use Of Enumerators' Returns For Wolverhampton 1851-1871[1]

Of the many sources examined for relevance to the hypotheses of Chapter 2, three stood out: the nineteenth century Enumerators' Returns, Trade Directories and Rating Lists. It proved impossible to link these sources effectively and they were therefore necessarily regarded as alternatives. Detailed evaluation showed that neither Trade Directories nor Rating Lists included a sufficient variety of variables with sufficient consistency to form the basis for temporal comparison of residential patterns in nineteenth century Wolverhampton. (A similar conclusion was drawn for the other towns investigated in this pilot study.) Enumerators' Returns were found consistently to contain a far broader data set and were chosen as the major source.

---

[1] This Section attempts to answer some of the issues raised in Section .5 of the Introduction.

Even so, great caution was exercised in the use of these returns as the basis for examining temporal change in residential patterns. Chapter 4 went to considerable lengths to assess the value of occupational data in measuring social status in nineteenth century Wolverhampton. Since hypotheses developed in Chapter 2 relate to a theoretical socio-economic status dimension, the existence of appropriate indicants was a pre-requisite of the hypothesis-testing strategy adopted. Doubts were expressed about application of the Registrar General's (1951) Classification of Occupations to nineteenth century data when this appeared to have undesirable effects. Most mining workers being listed simply as "miner" or "coal miner", too many individuals appeared to be allocated to social class III because twentieth century miners are skilled workers. Evidence for nineteenth century Wolverhampton confirmed that a fine gradation of skill and remuneration did exist, though not obvious from census data. But, despite this, mining areas still emerged as districts of low social status, suggesting misallocation to class III may have been less serious that originally thought. Indeed an overall appraisal of social class data together with other status measures (number of servants and child employment) demonstrated the value of the Registrar General's classification. For use in small subareas of Wolverhampton, it was decided to group together class I and class II and also class IV with class V to reflect high and low status respectively. This was found to work well.

Indicants were also needed for a hypothetical occupational dimension. Clearly some selection was needed, for it was impossible to use all the occupations represented in nineteenth century Wolverhampton. Nor would it have been appropriate, in testing hypotheses regarding the dimensions of residential differentiation, to have chosen occupational categories which exhibited no tendency to localization within the town. After a review of the location of industry and employment in nineteenth century

Wolverhampton, the proportions working in dealing, in mining and in manufacturing were selected as crude indices of occupational segregation. This choice raised very few problems in later analyses.

Chapter 5 examined the Enumerators' Returns for indicants of family status and household complexity; again suitable measures were derived. Similarly, Chapter 6 scrutinized possible measures of ethnicity and migration status before appropriate indicators were adopted. Once the variable list had been chosen it was regarded as immutable: deletion of indicants which failed to measure the intended dimension might be interpreted as removal of variables which conflicted with the hypotheses of Chapter 2. Only a narrow line separates variables which are genuinely unreliable from those which appear so purely because the significance of their variations is not understood. For this reason, all 26 variables were retained throughout. It is now useful to evaluate the variable list presented in Table 7.1 and to suggest possible amendments for future analyses. In offering such conclusions, attention is given not only to the reliability or value of the variables, but also to their "cost" in terms of time spent extracting them from the Enumerators' Returns. Certain variables were very "costly" in this respect.

Least satisfactory was variable 09, based on an interval measure of fertility. A great amount of effort was devoted to developing interval measures and this was the best of the alternatives. Its estimation from Enumerators' Returns was very time consuming and the results were of little value. It seems unlikely that interval measures of fertility will prove to be useful in future analysis of nineteenth century census data. The fertility ratio (variable 10) was far less costly of research time and proved more useful, but was still far from ideal: young female domestic servants in high status households inflated the number of females aged 15-44, so depressing fertility ratios. More determined efforts to

exclude single females offer one solution and if this proves difficult, as with some Enumerators in Wolverhampton, the proportion of total populatio aged 0-4 might be examined as an alternative. The best measure of fertility in the sense of "familist life styles" was undoubtedly variable 11 (heads with children) but - in an era when contraception was becoming more widespread - it is clear that a distinction exists between low levels of fertility within a familist value system (family limitation), and non-familist life styles per se. It is argued that indicants of both should be present in any analysis, and that variable 11 refers to life styles rather than to the number of children typically born to a married couple.

The only other area for dissatisfaction was household complexity. The strong link between servants (variable 03 and an indicant of status) and non-kin (22) is unfortunate. This could have been avoided by excluding servants from non-kin; the variable measured would then be what was termed the "remainder". But the remainder includes both employees and lodgers. These two groups should be distinguished separately and expressed as a proportion of the total remainder or of the total population. The prevalence of employees in high status city centre households, and their relative absence from similar suburban households would then be clear. With such an approach it might be better then to abandon the use of employees as a criterion governing allocation to social class. The numbers differently treated without this criterion would be small and all definitional links between status and household composition would then have been removed. One by-product of the subdivision of non-kin into servants, employees and lodgers must, however, be clear: a larger sample size might be required to provide reliable small area data.

The question of variable selection is a difficult one. The variables used were chosen as indicants of the theoretical dimensions outlined in Chapter 2, and yet in some senses selection was rather arbitrary. There

were other variables, and different forms of the variables chosen, which might equally have been adopted. Inevitably the "cost-effectiveness" of particular variables is an important consideration and the foregoing critique may therefore provide some guidance for future work. But the effect of adopting different variable sets which still attempt to reflect the major theoretical axes is unknown. Perhaps even more serious is the reliance upon census data alone, with its pre-selection of variables for a totally different purpose.

Finally, the present analysis has numerous implications for the areal units within which analysis is pursued. First, Chapter 9 demonstrated that, although many important relationships appeared consistently across a wide range of scales of analysis, the size of the areal units used did have some effect upon the results obtained. There is an obvious need for guidance concerning the scale of analysis appropriate to the study of residential differentiation and ultimately such guide-lines must be incorporated within the theory regarding urban residential patterns. This being the case empirical analyses should be pursued at different levels of aggregation to facilitate the development of generalizations concerning the types of differentiation operative at particular scales. Once the question of the scale of analysis has been settled the choice of areal units at that scale obviously arises. Intercensal variations in ED boundaries make them unsuitable for detailed temporal comparison, but the considerable labour involved in reassembling Enumerators' Returns into grid squares acts as a strong argument favouring EDs. The most cost-effective procedure is likely to be a compromise for a fixed subareal framework may be derived from census data merely be regrouping <u>parts</u> of various EDs. Hence the ED frameworks present in the census data could be used as a context within which fixed areal units might be defined. Intercensal change would be eliminated by regrouping street addresses

within particular EDs into the fixed subareal pattern. This method is likely to save a considerable amount of time compared with grid square approaches, and this might be used to increase the sample size. Additionally, sampling fractions could be varied across the city to provide detail in sparsely populated suburban areas which is inevitably lacking when grid units are adopted since the sample must be drawn pro rata from EDs before the allocation to grid squares is known.

Thus, despite the caution with which the Enumerators' Returns were treated, they proved most suitable for testing the hypotheses of Chapter 2. With the benefits of hindsight, however, the census data might have been treated more effectively. Attempts to adopt interval measures of fertility proved worthless, and household complexity might have been better analyzed in terms of separate groups of employees and lodgers. The most efficient subareal framework seems likely to be a set of fixed units based upon EDs rather than upon grid squares. These minor modifications apart, a second analysis would be pursued along very similar lines to those adopted here. The same data source would be used, most of the same variables would be extracted and they would again be estimated by systematic sampling within a subareal frame which remained constant throughout the period studied.

11.2 Methodological Implications[1]

Certain methodological issues have already been examined in Chapter 9 and need not be repeated in detail here. Section 9.3 suggested that alternative analytical techniques did produce different results, but that the differences were slight when translated into substantive interpretations. Different factoring procedures, for example, provided slightly different dimensions of residential differentiation, but when temporal changes were

---

[1] This Section concerns issues raised in Section .4 of the Introduction.

examined very similar trends were apparent whichever technique was used. When temporal comparison is intended the use of the same factoring procedure throughout seems to be far more important than the choice of the particular procedure itself. This conclusion is reinforced by the variations in the order of the main dimensions as portrayed using alternative factoring procedures. In a similar way different rotations did not reveal startingly different patterns and the major effect appeared to be upon the clarity with which the dominant themes emerged.

Population weighting and variable transformation to reduce skewness were both adopted in the central analyses of the present work (Chapter 8), but in fact the effect upon substantive interpretations were remarkably limited. It seems probable that the benefits from these two procedures are highly data dependant and that, in different circumstances, considerable benefits might have accrued. Weighting was adopted as a means of excluding one more potential source of spurious "temporal change" - that due to variations in population distribution with respect to the fixed grid unit framework. Variable transformations adopted were of two types: logarithmic and square root. Though skewness was considerably reduced by these procedures it is perhaps possible that the full benefits of transformation would only be derived by a greater variety of transformations. Evans et al. (1975) also argue that the presentation of variables may be improved, so reduced skewness very simply; hence "sex ratio" tends to be more skewed than "percentage of total population, male".

Section 9.4 considered the stability of conclusions with respect to alternative treatments of temporal change. Chapter 8 had inferred change from differences between component structures derived from analyses of variable scores in 1851. 1861 and 1871 respectively. The approach of Section 9.4 was more direct being based on changes in variable scores over the period. The conclusions of these alternative views of change were

very different. This does not, however, imply that the changes observed depend upon whether one examines the change in the ecological structure or the structure of ecological change (Hunter, 1971), for the two sets of conclusions were not only compatible but also mutually illuminating. The implication is that the two approaches offer not alternative, but complementary, views of the temporal evolution of residential patterns.

It is also relevant to examine the computer procedure which permitted temporal comparison of component structures using congruence coefficients. Veldman's procedure had one very definite virtue: when two components were very similar the congruence coefficients made this obvious. In these circumstances the two components were linked to each other by a coefficient exceeding 0.9 and their links with other components were very weak. Unfortunately, interest focussed upon situations in which similarities were weaker - the central hypothesis being one of temporal change. Here Veldman's technique allowed the axes closest, second closest, etc. to a particular component to be determined and often this provided a view of the component under consideration which corresponded very closely with its original interpretation. Hence the interpretation of a particular component could be "built up" from a consideration of those axes in a different analysis to which it was similar. But the main weakness of the technique lies in the examination of dissimilarity. Where two components were found to be only moderately similar, it was not possible to attribute the differences to a particular group of variables. When this was required, it could only be achieved by subjective interpretation of variable loadings, and it was to avoid just such subjectivity that Veldman's technique was used at all. While congruence coefficients were useful in many cases, it should not be thought that they form the ideal technique for an analysis of temporal variations in residential patterns.

Indeed much the same may be said of the factor ecological approach itself for the factorial approach has two major, and related, limitations. First, it is impossible to interpret components except in their own terms, as composite dimensions with different variables loading more or less strongly on that dimension. It is true that the implications of particular dimensions of residential differentiation may be suggested, but such interpretation falls short of the objective description of data that factorial ecology is often taken to be. In brief, components may be derived objectively, their meaning may not. From this stems the second limitation of factorial ecology; namely that it is very difficult to integrate factorial ecology with historical analysis. The contemporary setting supplies a few obvious explanatory details, such as the influx of Irish immigrants prior to the 1851 census, and these are clearly related to the dimensions of residential differentiation which emerge in a components analysis. But the relationship between the contemporary background and component structures is usually far more obscure.

There are several reasons for this. Background information derived from contemporary Parliamentary Papers is not always directly relevant to the issues raised in the changing component structures. The written sources provide evidence which, in a very general way, reveals the processes of urbanization and population growth in Wolverhampton, but does not offer information regarding consequent changes in household composition which might illuminate some of the changes in the dimensions of residential differentiation. Even if such information were available, however, it would remain difficult to integrate with the statistical constructs represented by components. The major reason for these difficulties goes beyond the type of information considered in the two approaches and beyond the way in which this material is presented. Far too little is known about inter-relationships within the urban system during rapid urbanization

for the connections between factorial ecology and historical context to be perceived immediately. Only as understanding advances will this problem be overcome and the links between evolution of component structures and of social patterns become apparent.

11.3 Empirical Findings And Their Theoretical Significance[1]

Drawing heavily upon the empirical findings for Wolverhampton 1851 to 1871 it is possible to modify the conceptual framework developed in Chapter 2 and to present generalizations regarding the temporal evolution of patterns of residential differentiation. Clearly, any generalizations derived in this manner must themselves be subjected to empirical testing before they can be regarded as important elements in an understanding of urban residential neighbourhoods.

In the late pre-industrial city the major dimension of residential differentiation was a composite social status/household complexity axis. At one extreme on this axis were areas containing a high status population whose households included servants and employees in addition to members of the head's family. Economic activity was organized largely at a domestic scale so that it was not uncommon for employer and employees to co-reside. As trade expanded, however, some employees were housed in separate properties built behind the main street frontage, and a fine-grained pattern of differentiation may have developed. At the opposite extreme on the major differentiating axis were areas dominated by the low status population. In these areas households were simpler, containing no servants or employees of the head and consisting very largely of members of the head's own nuclear family. In many cases, districts occupied by the poorer social groups were peripheral to the urban area

---

[1] This Section summarizes evidence relevant to the hypothesis of Section .3 of the Introduction.

whilst high status was more centrally located. This pattern was reinforced by the fact that a large proportion of a town's high status population was in fact engaged in retailing, commerce and business and other activities which were largely confined to the central areas. At this time a small ethnic minority may have existed but was not of major significance.

During industrialization major changes occurred to this pattern. First, the domestic organization of economic activity was replaced by organization at a larger scale and, most important, affected some sectors earlier than others. Typically transport and many branches of manufacturing were affected first: canal and railway warehouses, railway stations and factories became very large employers of labour. In these sectors the co-residence of employer and employee became impossible but often housing was provided specifically in connection with employment; as a result coarser grained patterns of differentiation may have begun to emerge. City centre retailing, dealing and business activities, however, were amongst the latest to forsake domestic organization and the co-residence of employer and employees. Hence, in the early industrializing period high status and household complexity were strongly linked with trading and dealing occupations concentrated in the city centre. Slowly this began to change. The rapid influx of population, attracted by the expanding employment opportunities of an industrializing city, had been accommodated by increased residential densities. Public transport was lacking and so new houses were crammed into the spaces behind street fronting properties. As burgages were built up in this way the central area became environmentally less attractive to the higher status groups. At the same time the commercial value of city centre sites began to rise since they lay at the business focus of a growing urban population. The high status groups therefore began to leave the city centre and set

up suburban homes on the urban periphery. Though public transport was absent, this group could afford private transport to work; gradually, horse bus services opened up too.

Migration of the higher status groups from the city centre had several important effects. First, the residential status of the central area began to decline. In 1841 the high status population of Wolverhampton was still very heavily concentrated in the centre; by 1871 (although the centre was still of above average status) this concentration had declined markedly. Second, there were changes in the structure of high status households which stemmed from the move to the suburbs. A leather merchant who moved from the centre to the suburbs took with him only his nuclear family and domestic servants; employees remained in the city centre. Many traders who left in fact put managers in their place - perhaps suggesting that deteriorations in the quality of the residential environment were at least as decisive as gains in commercial floor space. As a result the association between high status and household complexity began to collapse - the composite differentiating dimension of the pre-industrial city began to disintegrate. Third, the population remaining in the city centre became increasingly dominated by non-kin and by loners for managers and other employees were rarely related. A significant number of "domestic" servants remained in such households, and it seems highly likely that many of these were actually performing commercial duties. Partly as a result of this, the sex structures of central areas moved in favour of females. The households which left for the suburbs included a disproportionate number of families including children. Hence the population of central areas began to show a marked lack of children, being dominated instead by older age groups. Many of the household heads who did remain were working widows so that female heads, working women and relatively old heads were all characteristic of the city centre. Detailed examination

of the Enumerators' Returns for Wolverhampton suggests that although many women were genuinely in charge of town centre businesses, some were only nominal or acting heads. Widows often had a son and his wife in the same household, and since the son's occupation was identical to that of his mother he might have been treated as the household head. Examination of a few cases of this type using Trade Directories revealed two in which the husband died before the Census (as suggested by a changed christian name at the same business address) and yet the man's widow was still treated as the census household head. In addition, a few "female heads" were listed as married so that it is possible their husbands were away on business.

By 1871, Wolverhampton's central area shared many of these characteristics, but the degree to which the pattern was manifest is understated in the foregoing analyses. The boundaries of areal units used for analysis include not only prime central area sites but also back streets containing poorer property and larger numbers of children. This is exaggerated by the "street frontage" plan of central dealing premises. In the nineteenth century the city centre meant the street fronting properties; behind these were courts and alleys housing the poor.

As these trends emerged, the composite social status/household complexity axis was replaced by two independent dimensions of residential differentiation: socio-economic status and family status. High status households were becoming less complex in structure as they moved to the suburbs, and clear age, sex, fertility and female activity differences were emerging as a complete family status axis. During industrialization the importance of ethnicity increased dramatically as Irish workers were attracted to the growing urban labour market. In 1841 the Irish were of low status and very heavily concentrated in a single "ghetto" area, but by 1851 there were also higher status Irish born household heads in some of the better

residential areas. This could be taken as the first seeds of integration and assimilation to the host, but such a view would be mistaken. Although assimilation and the resultant declining importance of ethnicity was expected, none was observed before 1871. Indeed by 1871 the higher status Irish had either left Wolverhampton altogether or had concentrated in an area of "ghetto" expansion towards the city centre. A similar pattern of change has been described by Ward (1968). The Irish were therefore even more strongly concentrated in the lower status groups than in 1851: Thernstrom (1969) provides a parallel description of continuing immigrant disadvantage in upward occupational movility in nineteenth century Boston. Though Irish households in Wolverhampton contained many loners, family nuclei were very much more prominent and multiple occupancy by family units was dominant. A similar pattern has been described in nineteenth century London by Lees (1969, 359-85) showing that the Irish were rarely rootless wanderers as is often suggested.

The culmination of these evolutionary trends is the modern city, in which socio-economic status, family status and ethnicity form independent dimensions of residential differentiation. At this stage, however, the simple spatial models often break down because of the dramatic impact of council housing.

In 1851 Wolverhampton was undergoing rapid industrialization, but stood much closer to the pre-industrial model than was the case in 1871. At the earlier date there was something approaching a composite social status/household complexity dimension for elements of social status and family status were still closely linked (though already dealing occupations were particularly important in this respect). Interestingly, Dennis (1974,1) describes Huddersfield in 1850 as "pre-industrial" in terms of community structure. By 1871 Wolverhampton had moved more towards the modern pattern with axes more closely analogous to the hypothetical independent socio-economic status, family status and ethnicity dimensions. The results of

the present analysis therefore constitute strong evidence in favour of temporal evolution in the dimensions of residential differentiation as outlined in Chapter 2. The main discordant element concerns ethnicity for it appears that Chapter 2 was completely erroneous in expecting any significant decline in the importance of ethnicity as a result of assimilation.

Wolverhampton thus proved a useful test-bed for hypotheses developed in Chapter 2. The only reason for dissatisfaction lay with the mining areas which, it might be argued, represent a distortion of any simple model since they cover suburban zones with a low status population which exists almost independent of the adjacent urban centre. In all other respects, however, Wolverhampton was well suited to the purposes of the study. The size of the town was such as to be manageable in comparative analyses by a single researcher, and its location was ideal since the research described here was undertaken at Birmingham University. Most important of all, however, population growth trends proved an adequate guide to the social processes that were underway and it was possible to select a town passing through a major phase of urbanization during the period covered by the Enumerators' Returns.

11.4 Towards A Better Understanding Of Urban Residential Patterns[1]

The present analysis may be characterized as a factor ecological process-function study of urban residential patterns. It follows from this, taken in conjunction with earlier arguments, that there are two major areas within which improvement is probable. First, analyses of individual - rather than ecological - data would illuminate the process of temporal change. Second, a complete integration of spatial form in

---

[1] This Section re-affirms the importance of elements isolated in Section .2 of the Introduction.

all its aspects would add to an understanding of the factors which influenced the social character of specific areas. These two areas of potential theoretical advance may be considered in turn.

In Section 10.2 individual relationships were examined in order to shed light upon changing ecological patterns, and this exercise proved very imformative. At an ecological level a high correlation between Irish born heads and low social status means simply that areas with large proportions of Irish born heads also had large proportions in the lower status groups; it is not permissable to infer that Irish born heads were of low status. In fact, analysis of individual relationships showed this to be the case so that, at the very least, individual relationships provide for valid explanation of observed patterns. But it is possible to learn very much more when ecological patterns are changing, as the following example demonstrates. Consider a town in which the ecological association between Irish born heads and low social status declined markedly. Such a decline might arise in several ways. First, formerly low status Irish born household heads may have moved up the social ladder so raising the status of the areas in which they lived. Secondly, formerly low status non-Irish household heads may have moved up the social ladder so raising the status of the areas in which the Irish lived. Thirdly, Irish born household heads may have continued in lowly social positions but moved within the town so that areas of high and low status all had the same proportions of Irish. Only an examination of individual relationships broken down by subarea within the town could decide between these alternative explanations.

Such an example may seem rather hypothetical, but an examination of the individual relationship between social status and household complexity over the period 1851 and 1871 (Table 10.3) demonstrated the declining complexity of households in all status groups; the declining complexity

of high status households losing "remainders" (i.e. non-kin excluding servants - in this case mainly employees) was particularly significant. As longer periods are examined and the range of ecological changes widens, the need for explanation is bound to increase. This implies giving far more attention to micro-level patterns of this type.

The second area of potential theoretical advance concerns the fuller integration of elements governing the spatial form of urban residential differentiation. Means by which the effects of landownership and date of development might be incorporated into factorial ecologies were suggested in Section 10.4. The possibility was also raised of examining the role of non-residential land uses, and the varied characteristics of such uses, in shaping residential patterns. But perhaps the major area of ignorance concerns the scale of residential differentiation. Little is known about the scale at which residential differentiation occurred in different eras - information of clear relevance to the theoretical framework developed earlier. There are grounds for believing that the scale of residential differentiation has increased both through time and with city size, but there is little solid empirical evidence. The impact of public transport and of council housing might be particularly significant in this respect. Until empirical analyses are replicated at many different scales it will be impossible to judge the generality of conclusions based on a single scale, and impossible too to know what scale of analysis is most appropriate to a particular study. The present work does not answer these questions, but it does demonstrate their importance and may therefore stimulate further research. Indeed much more research is essential to the development of hypotheses based on a full form-function-process approach and this, it has been argued, is pre-requisite to a better understanding of the urban residential system.

APPENDIX 1

WARD ANALYSES

Table A1.1 Components Loading Matrix: WA1851

WA1851	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	-0.30	0.74	0.24	0.48	0.13	-0.04	0.19
02	0.74	-0.37	-0.18	-0.48	0.10	-0.05	-0.18
03	-0.05	0.85	0.24	0.43	0.05	-0.02	0.12
04	-0.43	-0.08	-0.35	-0.33	-0.16	0.73	0.00
05	0.00	-0.39	-0.14	-0.89	-0.10	0.07	-0.06
06	-0.00	0.16	0.38	0.52	0.73	0.03	-0.05
07	-0.10	0.35	0.88	0.26	0.14	-0.01	0.02
08	-0.08	0.03	-0.11	0.09	0.97	-0.09	0.03
09	0.09	0.30	0.94	0.02	0.02	-0.05	0.01
10	-0.54	-0.42	-0.35	-0.40	-0.35	-0.23	0.22
11	0.00	-0.94	-0.12	-0.12	-0.24	0.06	0.12
12	-0.40	0.72	0.49	0.20	0.00	0.05	0.10
13	0.15	0.61	0.41	0.61	0.07	-0.09	-0.20
14	-0.83	0.27	-0.23	0.14	0.33	-0.07	0.15
15	0.02	0.12	0.76	0.29	-0.51	-0.18	-0.09
16	0.97	0.08	0.10	-0.04	0.15	-0.07	0.02
17	---	---	---	---	---	---	---
18	0.94	-0.21	-0.24	0.00	-0.00	-0.09	0.04
19	0.79	-0.23	-0.11	-0.30	-0.22	-0.18	-0.34
20	0.43	-0.54	-0.59	-0.33	0.11	0.12	-0.12
21	0.88	0.20	-0.10	0.22	-0.18	0.05	0.27
22	0.77	0.45	0.24	0.32	-0.10	-0.07	0.07
23	-0.46	0.56	0.45	0.37	0.07	0.32	-0.00
24	0.06	-0.38	-0.24	-0.68	-0.43	0.35	0.00
25	0.31	0.83	0.27	0.10	-0.33	0.05	0.04
26	-0.33	-0.12	-0.47	-0.00	0.56	-0.43	-0.36

Table A1.2 Congruence Coefficients GU1851/WA1851

COMPONENTS GU1851	COMPONENTS WA1851						
	I	II	III	IV	V	VI	VII
I	-0.0404	0.8311	0.0011	0.4475	-0.0957	-0.0956	-0.2988
II	0.9820	0.0697	-0.1021	-0.0140	0.0495	-0.1182	0.0616
III	0.0913	-0.0414	0.4333	0.2346	0.6652	0.5293	-0.1565
IV	-0.0399	0.1901	0.2544	0.2486	-0.0202	-0.0010	0.9139
V	-0.1431	0.0262	-0.2140	-0.0082	0.7033	-0.6589	0.0648
VI	-0.0601	0.3705	-0.6043	-0.4029	0.2251	0.4892	0.2038
VII	0.0070	0.3587	0.5715	-0.7212	0.0153	-0.1515	-0.0370

Table A1.3 Components Loading Matrix: WA1861

WA1861	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	-0.40	0.52	0.28	-0.67	0.09	0.07	-0.03
02	0.77	-0.19	-0.01	0.26	-0.14	-0.48	-0.17
03	-0.31	0.64	0.36	-0.51	0.10	0.27	-0.00
04	-0.11	-0.15	-0.21	0.38	-0.34	-0.24	0.76
05	-0.03	-0.93	0.13	0.27	-0.08	-0.15	0.07
06	-0.41	-0.14	0.55	-0.07	0.57	-0.38	0.10
07	-0.16	0.25	0.01	-0.15	-0.07	0.93	-0.01
08	-0.48	-0.18	0.64	0.17	0.36	0.14	0.36
09	0.10	0.24	-0.08	-0.83	0.45	0.11	-0.08
10	0.12	-0.33	-0.85	0.18	-0.05	-0.22	0.24
11	0.58	-0.15	-0.15	0.49	-0.59	-0.06	0.05
12	0.07	0.43	0.25	-0.02	0.72	0.45	-0.04
13	-0.04	0.63	0.69	0.13	0.00	-0.23	0.20
14	-0.65	0.09	0.09	0.28	0.08	0.10	0.67
15	0.05	0.02	0.56	0.14	0.01	-0.50	-0.63
16	0.91	0.01	0.08	0.08	0.12	-0.17	-0.32
17	---	---	---	---	---	---	---
18	0.93	-0.19	-0.19	0.10	-0.15	-0.07	0.06
19	0.49	-0.16	-0.18	0.80	-0.07	-0.20	0.02
20	-0.02	-0.15	-0.02	0.17	-0.94	0.17	0.11
21	0.96	0.05	0.01	-0.14	0.10	0.19	0.00
22	0.55	0.40	0.26	-0.62	0.08	0.23	-0.05
23	-0.51	0.73	0.10	-0.35	0.20	0.12	-0.04
24	-0.11	0.00	0.96	0.17	-0.08	0.02	0.13
25	0.03	0.82	0.23	-0.37	0.26	0.19	-0.10
26	-0.18	-0.33	0.09	0.81	0.05	0.07	0.40

Table A1.5 Components Loading Matrix: WA1871

WA1871	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	0.31	-0.60	0.24	-0.16	-0.67	-0.02	0.01
02	-0.16	0.62	-0.21	0.21	0.67	0.12	0.14
03	0.43	-0.44	0.37	0.01	-0.67	0.13	0.05
04	-0.30	0.05	-0.21	0.27	0.69	0.54	-0.11
05	-0.19	0.06	-0.75	0.24	0.50	0.02	0.27
06	0.51	-0.23	-0.29	-0.76	-0.06	-0.00	0.10
07	0.95	0.17	-0.11	-0.01	-0.20	-0.02	0.01
08	-0.27	-0.34	0.07	-0.11	-0.16	0.87	0.04
09	-0.91	-0.06	0.01	0.16	-0.16	0.17	0.27
10	-0.73	0.14	-0.28	0.22	0.28	0.42	-0.17
11	-0.87	0.13	-0.42	-0.05	0.07	0.05	-0.12
12	0.68	-0.58	0.38	-0.08	0.01	-0.04	0.18
13	0.28	0.07	0.89	-0.03	-0.20	0.25	0.10
14	-0.07	-0.45	-0.64	0.03	0.60	0.10	-0.02
15	0.09	0.00	0.81	0.07	-0.46	-0.33	0.02
16	0.12	0.95	0.07	0.04	0.09	-0.05	0.22
17	---	---	---	---	---	---	---
18	0.33	0.77	-0.02	0.19	0.34	-0.31	-0.18
19	-0.05	0.37	-0.11	0.79	0.43	0.15	-0.00
20	0.12	0.29	-0.16	0.14	0.90	-0.16	-0.02
21	-0.02	0.92	0.20	0.25	-0.07	-0.07	-0.18
22	0.74	0.23	0.39	-0.23	-0.28	-0.30	0.03
23	0.13	-0.71	0.47	-0.17	-0.35	0.30	-0.00
24	-0.00	0.17	-0.44	0.75	0.24	-0.35	0.14
25	0.65	0.07	0.27	-0.04	-0.63	0.25	-0.15
26	-0.09	-0.03	-0.39	0.27	0.86	-0.06	-0.01

Table A1.6 Congruence Coefficients GU1871/WA1871

		COMPONENTS WA1871						
		I	II	III	IV	V	VI	VII
COMPONENTS GU1871	I	0.7495	-0.2654	0.2615	0.0543	0.0852	0.0887	0.5305
	II	0.1991	0.9430	-0.0157	-0.0782	0.1826	0.0583	0.1672
	III	-0.2169	-0.0648	0.0346	0.5654	0.6568	0.4429	0.0195
	IV	0.2158	-0.1567	-0.5495	-0.5755	0.3046	0.4163	-0.1720
	V	-0.0639	0.0478	0.6815	-0.2881	-0.1911	0.5851	-0.2594
	VI	0.1910	-0.0473	0.3625	-0.1953	0.5661	-0.5117	-0.4576
	VII	0.5143	0.0837	-0.1798	0.4678	-0.2798	0.1230	-0.6196

Table A1.7 Congruence Coefficients WA1851/WA1871

		COMPONENTS WA1871						
		I	II	III	IV	V	VI	VII
COMPONENTS WA1851	I	0.3550	0.9106	0.1751	0.0433	0.0241	-0.0935	0.0546
	II	0.8272	-0.3414	0.1493	0.2728	-0.2942	0.1125	-0.0565
	III	-0.1818	-0.0056	0.2952	-0.1355	-0.6173	-0.0094	0.6930
	IV	0.0221	-0.0704	0.5846	-0.6433	-0.1063	-0.1040	-0.4656
	V	0.3362	-0.0250	-0.3350	-0.6536	0.2760	0.3815	0.3539
	VI	-0.2011	0.1091	0.3049	0.1985	0.0121	0.8948	-0.1201
	VII	-0.0519	0.1917	-0.5594	-0.1579	-0.6665	0.1464	-0.3963

APPENDIX 2

E.D. ANALYSES

Table A2.1 Components Loading Matrix: ED1851

ED1851	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	-0.28	-0.60	0.54	0.01	0.24	0.15	-0.09
02	0.56	0.37	-0.25	0.15	-0.20	-0.05	0.11
03	-0.19	-0.61	0.19	0.03	0.17	-0.14	-0.17
04	-0.02	0.67	-0.18	-0.12	-0.04	-0.01	0.26
05	-0.02	0.59	-0.07	0.26	-0.09	-0.08	-0.28
06	-0.03	0.03	0.49	0.64	0.23	-0.20	-0.03
07	-0.12	0.03	0.76	0.14	-0.07	-0.26	0.04
08	-0.00	0.04	0.00	0.82	-0.01	0.21	-0.07
09	0.03	-0.60	0.05	0.03	-0.18	-0.21	-0.01
10	-0.22	-0.03	-0.72	0.03	-0.32	-0.09	0.21
11	0.07	0.16	-0.36	-0.06	-0.16	0.03	0.79
12	-0.07	-0.18	-0.01	0.08	0.82	-0.20	-0.26
13	0.25	0.00	0.41	0.01	0.73	0.14	0.14
14	-0.68	-0.00	-0.04	0.44	-0.02	0.20	0.07
15	-0.23	-0.60	-0.14	-0.31	0.19	-0.00	-0.10
16	0.77	-0.05	-0.07	0.09	-0.02	-0.09	-0.23
17	---	---	---	---	---	---	---
18	0.89	0.26	-0.04	-0.01	0.12	0.03	0.11
19	0.33	0.33	-0.21	-0.33	-0.24	0.48	-0.17
20	0.16	0.80	-0.00	-0.10	0.00	0.11	-0.02
21	0.83	0.03	0.10	-0.02	0.09	0.07	0.31
22	0.56	-0.25	0.59	-0.14	0.04	0.07	-0.25
23	-0.41	-0.27	0.57	0.18	0.07	0.06	0.02
24	0.15	0.47	-0.46	-0.27	-0.14	-0.51	0.10
25	0.03	-0.35	0.66	0.02	0.03	0.03	-0.37
26	-0.22	0.30	-0.05	0.24	-0.07	0.76	0.13

Table A2.2 Congruence Coefficients GU1851/ED1851

		COMPONENTS ED1851						
COMPONENTS GU1851		I	II	III	IV	V	VI	VII
	I	-0.1619	-0.4607	0.7344	-0.2291	0.0392	0.2924	-0.2876
	II	0.9568	0.0846	0.1094	-0.0592	0.0537	0.2022	-0.1348
	III	0.0323	0.2762	0.5263	0.5859	0.2799	-0.4727	-0.0256
	IV	0.0427	-0.4507	-0.2677	0.0205	0.8461	-0.0361	0.0766
	V	-0.0713	-0.0945	-0.1118	0.7222	-0.0712	0.6684	0.0006
	VI	-0.2239	0.6611	-0.0253	-0.2158	0.4134	0.3429	-0.4207
	VII	0.0168	-0.2349	-0.2947	0.1793	-0.1594	-0.2907	-0.8459

Table A2.3 Components Loading Matrix: ED1861

ED1861	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	0.86	-0.03	-0.09	-0.09	-0.17	-0.08	-0.04
02	-0.40	0.68	0.09	-0.00	0.20	0.02	-0.00
03	0.61	-0.09	0.14	0.03	-0.09	0.01	-0.15
04	-0.23	-0.05	0.03	0.01	0.03	0.33	0.61
05	-0.36	-0.06	0.24	-0.08	0.65	0.00	0.25
06	0.27	0.00	0.47	0.05	0.21	0.24	-0.10
07	0.10	-0.04	0.00	0.10	-0.04	-0.05	0.07
08	-0.01	-0.01	0.77	-0.05	-0.10	0.11	0.07
09	0.29	-0.29	-0.06	-0.35	-0.13	-0.33	-0.23
10	-0.62	-0.05	-0.10	-0.42	-0.03	-0.06	-0.01
11	-0.40	0.05	-0.50	-0.21	0.57	0.10	-0.06
12	-0.05	-0.20	-0.01	0.81	-0.31	-0.00	0.02
13	0.16	0.02	-0.00	0.83	0.15	0.02	0.12
14	-0.04	-0.26	0.33	0.07	0.22	0.70	-0.04
15	0.07	-0.35	0.08	0.02	0.17	-0.76	-0.17
16	0.11	0.79	0.07	0.13	-0.02	0.04	0.05
17	---	---	---	---	---	---	---
18	-0.25	0.79	0.03	-0.00	-0.33	-0.02	0.00
19	-0.66	0.18	0.06	0.22	0.07	0.01	-0.00
20	-0.01	-0.00	0.04	0.14	0.06	-0.02	0.91
21	0.23	0.68	-0.37	-0.14	0.15	0.13	-0.23
22	0.63	0.49	-0.17	-0.05	-0.16	-0.21	0.03
23	0.65	-0.32	-0.02	0.19	0.41	-0.05	-0.05
24	-0.41	-0.10	-0.66	-0.04	-0.26	0.22	0.20
25	0.77	0.13	0.12	0.21	-0.03	-0.08	-0.06
26	-0.42	-0.02	0.62	0.03	0.21	0.25	0.22

Table A2.4 Congruence Coefficients GU1861/ED1861

		COMPONENTS ED1861						
		I	II	III	IV	V	VI	VII
COMPONENTS GU1861	I	0.9505	0.0426	0.1909	0.0865	-0.1401	0.0934	0.1497
	II	-0.0078	0.9861	-0.0844	0.0455	0.0985	0.0418	-0.0837
	III	-0.2453	0.0322	0.7071	0.2570	0.0278	0.5895	0.1563
	IV	-0.0406	0.0036	-0.3021	0.1498	0.3576	0.0329	0.8692
	V	0.1804	-0.1452	-0.1380	0.1651	0.8175	0.2474	-0.4130
	VI	-0.0457	-0.0315	-0.0868	0.9319	-0.1699	-0.2816	-0.1123
	VII	0.0000	0.0526	0.5818	-0.0782	0.3806	-0.7075	0.0856

Table A2.5 Components Loading Matrix: ED1871

ED1871	COMPONENTS						
VARIABLE	I	II	III	IV	V	VI	VII
01	0.43	-0.36	-0.44	-0.29	0.31	-0.09	-0.01
02	-0.04	0.38	0.70	0.28	-0.00	0.14	0.04
03	0.03	-0.50	0.19	-0.19	0.03	-0.00	-0.56
04	-0.06	0.54	0.10	0.35	0.27	0.07	-0.07
05	0.04	0.74	0.06	0.17	0.10	0.00	0.03
06	0.29	-0.06	0.09	0.14	0.81	0.06	-0.00
07	0.28	-0.36	0.11	0.02	0.20	-0.02	0.57
08	-0.55	0.15	-0.06	0.16	0.73	-0.07	0.09
09	-0.52	-0.34	-0.07	0.28	-0.08	0.11	0.22
10	-0.55	0.35	-0.09	0.24	-0.27	-0.31	0.03
11	-0.63	0.13	0.10	0.20	-0.05	-0.49	-0.18
12	0.73	-0.18	-0.02	0.16	-0.05	0.21	-0.03
13	0.81	-0.04	0.09	0.08	0.07	-0.01	0.08
14	-0.03	0.15	0.00	0.81	0.19	0.01	0.14
15	-0.15	-0.16	-0.19	-0.76	-0.08	0.08	-0.12
16	0.19	0.02	0.77	-0.01	0.06	0.01	0.01
17	---	---	---	---	---	---	---
18	0.06	-0.03	0.63	0.04	0.01	0.25	0.53
19	-0.24	0.71	0.18	0.00	-0.16	-0.01	0.04
20	0.23	0.07	0.19	0.06	-0.11	0.76	0.17
21	-0.21	-0.21	0.60	-0.06	-0.03	-0.49	-0.02
22	0.28	-0.59	0.26	-0.47	0.11	0.02	0.09
23	0.33	-0.15	-0.32	-0.12	0.01	-0.17	-0.51
24	0.11	0.23	0.03	0.25	-0.43	-0.50	0.26
25	0.41	-0.10	0.01	-0.51	0.43	0.08	0.11
26	-0.07	0.43	0.13	0.55	0.27	0.44	0.02

Table A2.6 Congruence Coefficients GU1871/ED1871

		COMPONENTS GU1871						
		I	II	III	IV	V	VI	VII
COMPONENTS GU1871	I	0.9097	-0.2676	-0.0011	0.2132	-0.0175	0.2338	-0.0203
	II	-0.0585	-0.1253	0.9687	0.0921	-0.0157	0.0194	0.1829
	III	0.0278	0.7484	0.1162	0.4175	-0.1444	0.3271	-0.3514
	IV	-0.0128	0.1234	-0.0544	0.3644	0.8806	-0.0526	0.2659
	V	-0.1433	-0.3016	0.1063	-0.2581	0.3889	0.4172	-0.6966
	VI	0.0009	0.2060	-0.0403	-0.4552	0.0434	0.6950	0.5136
	VII	0.3841	0.4517	0.1796	-0.642	0.2238	-0.4221	-0.1511

Table A2.7 Congruence Coefficients ED1851/ED1871

		COMPONENTS ED1871						
		I	II	III	IV	V	VI	VII
COMPONENTS ED1851	I	-0.0551	-0.1212	0.9509	-0.2205	-0.0415	0.0205	0.1659
	II	0.3313	0.7796	0.1251	0.3327	-0.0375	0.0432	0.3908
	III	0.5333	-0.1415	-0.1216	-0.4541	0.5510	-0.2423	0.3351
	IV	-0.0848	-0.2546	0.1326	0.6475	0.6633	0.2246	0.0246
	V	0.7547	-0.1858	0.1490	0.2094	-0.2174	0.0819	-0.5252
	VI	-0.1202	0.4972	0.0980	-0.3434	0.4438	0.2062	-0.6094
	VII	-0.1070	0.1044	0.1272	0.2311	0.0947	-0.9161	-0.2446

APPENDIX 3

ANALYSES USING ALTERNATIVE APPROACHES

A3.1 Factorial Ecology Of Wolverhampton 1871 By Grid Units: Principal Axis Factoring With Iteration And Varimax Rotation

Table A3.1 shows the factor loading matrix produced by principal axis factoring and varimax rotation; using a convergence criterion of 0.001 thirty four iterations were required. The seven factors extracted were those with eigenvalues exceeding 1.0 and together accounted for 80.3% of common variance. The strongest loadings and respective interpretations were as follows.

Factor I - Family Status (Dealing)

Loadings +0.7 or higher, variables 12 (% aged 65+) and 07 (% heads, female).
Loadings +0.4 to +0.69, variables 13 (mean age of head), 25 (% dealing) and 23 (% non-kin loners).
Loadings -0.7 or lower, variable 11 (% heads with children).
Loadings -0.4 to -0.69, variable 10 (fertility ratio).

Factor II - Overcrowding and Ethnicity (Low Status)

Loadings +0.7 or higher, variables 18 (family nuclei per 100 households), 17 (density) and 21 (persons per household).
Loadings +0.4 to +0.69, variables 16 (% heads Irish etc.) and 02 (% class IV and V).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 23 (% non-kin loners) and 01 (% class I and II).

Factor III - (Low) Social Status (Local Manufacturers)

Loadings +0.7 or higher, variable 19 (sex ratio).
Loadings +0.4 to +0.69, variables 26 (% manufacturing), 04 (% heads' children 5-14 working), 05 (% heads' children 15+ working) and 02 (% class IV and V).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 01 (% class I and II) and 22 (% households with non-kin).

Factor IV - Feminism (Local Manufacturers)

Loadings +0.7 or higher, variable 06 (% labour force, female).
Loadings +0.4 to +0.69, variables 08 (% heads' wives working), 14 (% born in Wolverhampton), 17 (density) and 26 (% manufacturing).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 15 (% heads, non-local English or Welsh).

Factor V - Mining

Loadings +0.7 or higher, variable 24 (% mining).
Loadings +0.4 to +0.69, absent.
Loadings -0.4 or lower, absent.

Table A3.1 Factor Loading Matrix: GU1871 Principal Axis Factoring and Varimax Rotation

VARIABLE	COMPONENTS						
	I	II	III	IV	V	VI	VII
01	0.29	-0.41	-0.61	-0.03	-0.28	0.37	0.07
02	-0.07	0.65	0.47	0.28	0.02	-0.03	-0.32
03	0.39	-0.23	-0.30	-0.32	-0.36	0.51	-0.27
04	0.17	0.09	0.56	0.37	0.06	-0.11	0.07
05	-0.24	0.04	0.52	0.30	0.33	-0.19	0.17
06	0.29	0.03	-0.06	0.82	0.00	0.05	-0.07
07	0.73	0.06	-0.30	0.27	0.11	-0.02	-0.15
08	-0.05	-0.00	0.04	0.69	-0.05	0.13	0.07
09	-0.00	-0.18	0.04	-0.00	-0.12	-0.42	-0.01
10	-0.60	-0.06	0.39	-0.01	0.06	-0.33	-0.33
11	-0.78	0.04	0.06	0.03	0.22	-0.32	0.12
12	0.83	-0.14	-0.03	0.11	0.02	0.00	0.09
13	0.60	0.14	0.29	0.02	-0.11	-0.09	-0.05
14	0.10	0.11	0.31	0.64	0.17	-0.38	-0.12
15	-0.00	-0.24	-0.17	-0.65	-0.28	0.29	0.04
16	0.20	0.67	0.14	-0.04	0.05	0.10	-0.10
17	0.07	0.75	0.12	0.49	-0.04	0.50	0.11
18	0.04	0.83	0.09	0.24	0.03	0.20	0.34
19	-0.13	0.09	0.91	-0.17	0.13	0.02	0.03
20	0.28	0.35	0.24	-0.10	-0.07	0.15	0.48
21	-0.35	0.74	-0.22	-0.20	-0.02	0.03	0.06
22	0.32	0.23	-0.57	-0.12	-0.01	0.57	0.13
23	0.43	-0.55	-0.09	-0.16	0.23	0.24	-0.32
24	-0.09	0.01	0.21	0.09	0.93	0.09	-0.03
25	0.55	0.00	-0.28	0.11	-0.38	0.56	0.13
26	0.06	0.13	0.67	0.45	0.07	-0.21	0.10

Factor VI - Dealing and Complexity

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 22 (% households with non-kin), 25 (% dealing) and 03 (domestic servants per household).
Loading -0.7 or lower, absent.
Loading -0.4 to -0.69, variable 09 (interval high fertility measure).

Factor VII - Occupied Males

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variable 20 (% males gainfully occupied).
Loadings -0.4 or lower, absent.

A3.2 Factorial Ecology Of Wolverhampton 1871 By Grid Units: Alpha Analysis And Varimax Rotation

Table A3.2 shows the factor loading matric produced by alpha factoring and varimax rotation with seven factors whose eigenvalues exceeded 1.0.

The interpretations of these are as follows.

Factor I - General Social Status

Loadings +0.7 or higher, variables 05 (% heads' children 15+, working) and 26 (% manufacturing).
Loadings +0.4 to +0.69, variables 02 (% class IV and V), 14 (% born in Wolverhampton), 19 (sex ratio), 10 (fertility ratio), 04 (persons per household), 11 (% heads with children), 17 (density), 24 (% mining) and 18 (family nuclei per 100 households).
Loadings -0.7 or lower, variables 01 (% class I and II) and 03 (domestic servants per household).
Loadings -0.4 to -0.69, variables 15 (% heads, non-local English or Welsh), 23 (% non-kin, loners), 22 (% households with non-kin) and 25 (% dealing).

Factor II - Family Status (Dealing and Crowding)

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 07 (% heads, female), 25 (% dealing), 12 (% aged 65+), 06 (% labour force, female), 17 (density), 18 (family nuclei per 100 households), 13 (mean age of head) and 20 (% males gainfully occupied).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 11 (% heads with children) and 10 (fertility ratio).

Factor III - Overcrowding and Ethnicity

Loadings +0.7 or higher, variable 21 (persons per household).
Loadings +0.4 to +0.69, variables 18 (family nuclei per 100 household), 22 (% households with non-kin), 16 (% heads, Irish etc.) and 17 (density).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 23 (% non-kin, loners).

Table A3.2 Factor Loading Matrix: GU1871 Alpha Factoring and Varimax Rotation

VARIABLE	COMPONENTS						
	I	II	III	IV	V	VI	VII
01	-0.85	0.13	-0.13	0.26	0.00	0.15	0.05
02	0.68	0.29	0.26	-0.08	0.21	-0.12	-0.36
03	-0.83	0.16	0.00	-0.16	0.01	-0.00	-0.38
04	0.53	0.34	-0.23	-0.18	-0.05	0.13	-0.05
05	0.71	-0.05	-0.14	-0.04	-0.22	0.08	0.11
06	0.19	0.61	-0.34	0.47	0.04	0.04	-0.07
07	-0.25	0.65	-0.23	0.13	0.02	-0.43	0.06
08	0.26	0.32	-0.21	0.42	0.00	0.31	-0.07
09	0.07	-0.16	-0.31	-0.07	0.39	-0.01	0.28
10	0.54	-0.58	-0.13	-0.04	0.15	-0.01	-0.27
11	0.51	-0.66	0.10	0.26	0.06	-0.05	-0.00
12	-0.29	0.64	-0.36	-0.19	-0.10	-0.16	0.17
13	0.03	0.51	-0.16	-0.39	0.13	-0.12	-0.01
14	0.64	0.30	-0.38	0.17	0.08	-0.12	-0.00
15	-0.65	-0.31	0.19	-0.34	-0.01	0.13	-0.02
16	0.23	0.39	0.45	-0.18	0.16	-0.23	-0.04
17	0.50	0.61	0.41	0.20	0.15	0.06	-0.07
18	0.40	0.55	0.66	0.09	-0.03	0.12	0.07
19	0.59	-0.10	0.00	-0.64	-0.16	0.14	-0.16
20	0.08	0.42	0.32	-0.38	-0.04	0.28	0.31
21	0.15	-0.07	0.82	0.14	0.23	-0.11	0.05
22	-0.62	0.39	0.46	0.20	-0.18	-0.05	0.05
23	-0.63	0.07	-0.44	-0.20	0.04	-0.04	-0.21
24	0.43	-0.06	-0.00	0.05	-0.61	-0.32	0.05
25	-0.62	0.65	0.07	0.04	-0.02	0.29	-0.16
26	0.71	0.28	-0.25	-0.18	-0.00	0.15	-0.00

Factor IV - Feminism

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 06 (% labour force, female) and 08 (% head's wives, working).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 19 (sex ratio).

Factor V - Mining

Loadings +0.4 or higher, absent.
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 24 (% mining).

Factor VI was not interpreted

Loadings +0.4 or higher, absent.
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 07 (% heads, female)

Factor VII was not interpreted

Loadings +0.4 or higher, absent.
Loadings -0.4 or lower, absent.

A3.3 Factorial Ecology Of Wolverhampton 1871 By Grid Units: Principal Components Analysis And Quartimax Rotation

The seven components with eigenvalues greater than 1.0 were as follows.

(See Table A3.3 for detailed loadings.)

Component I - Family Status (Dealing)

Loadings +0.7 or higher, variables 12 (% aged 65+) and 07 (% heads, female).
Loadings +0.4 to +0.69, variables 13 (mean age of head), 25 (% dealing), 23 (% non-kin, loners) and 03 (domestic servants per household).
Loadings -0.7 or lower, variable 11 (% heads with children).
Loadings -0.4 to -0.69, variables 10 (fertility ratio) and 21 (persons per household).

Component II - Overcrowding and Ethnicity (Low Status)

Loadings +0.7 or higher, variables 18 (family nuclei per 100 households), 21 (persons per household), 16 (% heads, Irish etc.) and 17 (density).
Loadings +0.4 to +0.69, variable 02 (% class IV and V).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 23 (% non-kin, loners).

Component III - (Low) Social Status (Local Manufacturers)

Loadings +0.7 or higher, variables 19 (sex ratio) and 26 (% manufacturing).
Loadings +0.4 to +0.69, variables 04 (% heads' children 5-14, working), 05 (% heads' children 15+, working), 14 (% born in Wolverhampton), 02 (% class I and II) and 10 (fertility ratio).
Loadings -0.7 or lower, variables 01 (% class I and II) and 22 (% households with non-kin).
Loadings -0.4 to -0.69, variables 03 (servants per household), 25 (% dealing) and 15 (% heads, non-local English or Welsh).

Table A3.3 Components Loading Matrix: GU1871 Principal Components Analysis and Quartimax Rotation

VARIABLES	COMPONENTS						
	I	II	III	IV	V	VI	VII
01	0.30	-0.35	-0.77	0.12	0.16	0.09	0.03
02	-0.02	0.63	0.56	0.13	0.13	-0.24	0.12
03	0.44	-0.20	-0.57	-0.23	0.37	-0.12	0.30
04	0.22	0.05	0.69	0.25	0.04	0.13	0.08
05	-0.23	-0.00	0.68	0.18	-0.33	0.18	-0.00
06	0.33	0.07	0.08	0.81	-0.03	-0.12	-0.00
07	0.73	0.10	-0.22	0.28	-0.23	-0.24	-0.11
08	-0.004	-0.01	0.13	0.81	0.14	0.13	0.11
09	-0.02	-0.18	0.12	-0.01	0.15	0.00	-0.87
10	-0.60	-0.11	0.52	-0.11	0.11	-0.37	-0.03
11	-0.81	0.02	0.23	-0.00	-0.17	-0.22	-0.14
12	0.86	-0.13	-0.05	0.11	-0.13	0.09	-0.07
13	0.69	0.15	0.31	-0.09	0.17	-0.05	-0.10
14	0.11	0.10	0.58	0.53	-0.16	-0.23	-0.19
15	-0.00	-0.24	-0.45	-0.59	0.29	0.18	0.13
16	0.24	0.77	0.12	0.15	0.00	-0.08	0.02
17	0.09	0.77	0.22	0.44	0.04	0.10	0.07
18	0.04	0.83	0.10	0.23	-0.05	0.34	0.15
19	-0.07	0.04	0.81	-0.35	0.06	0.16	0.19
20	0.29	0.36	0.14	-0.13	0.06	0.74	-0.02
21	-0.40	0.77	-0.22	-0.15	0.00	0.04	-0.03
22	0.32	0.28	-0.74	0.00	-0.08	0.21	0.24
23	0.50	-0.54	-0.26	-0.15	0.29	-0.22	0.09
24	-0.08	0.00	0.34	-0.01	-0.80	-0.05	0.23
25	0.59	0.05	-0.49	0.21	0.32	0.23	0.28
26	0.10	0.10	0.80	0.29	0.00	0.12	-0.03

Component IV - Feminism (Local Manufacturers)

Loadings +0.7 or higher, variables 08 (% heads' wives, working) and 06 (% labour force, female).
Loadings +0.4 to +0.69, variables 14 (% born in Wolverhampton) and 17 (density).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 15 (% heads, non-local English or Welsh).

Component V - Mining

Loadings +0.4 or higher, absent.
Loadings -0.7 or lower, variable 24 (% mining).
Loadings -0.4 to -0.69, absent.

Component VI - Male Occupancy

Loadings +0.7 or higher, variable 20 (% males gainfully occupied).
Loadings +0.4 to +0.69, absent.
Loadings -0.4 or lower, absent.

Component VII was not interpreted

Loadings +0.4 or higher, absent.
Loadings -0.7 or lower, variable 09 (interval fertility measure).
Loadings -0.4 to -0.69, absent.

A3.4 Factorial Ecology Of Wolverhampton 1871 By Grid Units: Principal Components Analysis And Equimax Rotation

The seven components with eigenvalues exceeding 1.0 were as follows.

(See Table A3.4 for detailed loadings).

Component I - Feminism (Local Manufacturers)

Loadings +0.7 or higher, variables 08 (% heads' wives, working) and 06 (% labour force, female).
Loadings +0.4 to +0.69, variables 14 (% born in Wolverhampton), 17 (density) and 26 (% manufacturing).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 15 (% heads, non-local English or Welsh).

Component II - Overcrowding, Ethnicity and Low Status

Loadings +0.7 or higher, variables 16 (% Irish etc.), 21 (persons per household 18 (family nuclei per 100 households), 17 (density) and 02 (% class IV and V).
Loadings +0.4 to +0.69, absent.
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 23 (% non-kin, loners) and 01 (% class I and II).

Component III - (Low) Social Status (Manufacturers)

Loadings +0.7 or higher, variable 19 (sex ratio).
Loadings +0.4 to +0.69, variables 26 (% manufacturing), 04 (% heads' children 5-14, working), 02 (% class IV and V) and 05 (% heads' children 15+, working).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 01 (% class I and II) and 22 (% households with non-kin).

Table A3.4 Components Loading Matrix: GU1871 Principal Components Analysis and Equimax Rotation

VARIABLES	COMPONENTS						
	I	II	III	IV	V	VI	VII
01	0.01	-0.41	-0.57	-0.46	0.18	0.23	0.26
02	0.26	0.70	0.47	0.09	0.01	-0.22	-0.01
03	-0.26	-0.20	-0.20	-0.61	0.31	0.04	0.47
04	0.38	0.06	0.63	0.17	0.16	0.10	-0.09
05	0.24	-0.00	0.45	0.58	-0.18	0.01	-0.21
06	0.82	0.05	-0.07	0.02	0.34	0.00	0.02
07	0.25	0.07	-0.30	0.00	0.80	0.06	0.08
08	0.83	-0.04	0.05	-0.04	-0.13	0.09	0.04
09	-0.03	-0.15	-0.06	-0.16	0.08	-0.01	-0.88
10	-0.04	0.01	0.39	0.12	-0.42	-0.63	-0.25
11	-0.01	0.09	-0.00	0.34	-0.61	-0.47	-0.29
12	0.11	-0.19	-0.01	-0.03	0.78	0.34	0.06
13	-0.00	0.17	0.37	-0.17	0.64	0.14	-0.09
14	0.60	0.14	0.28	0.31	0.25	-0.22	-0.30
15	-0.62	-0.26	-0.11	-0.42	-0.14	0.17	0.21
16	-0.10	0.77	0.12	0.02	0.25	0.09	0.04
17	0.50	0.73	0.13	0.08	0.02	0.21	0.04
18	0.26	0.75	0.07	0.16	-0.08	0.44	0.14
19	-0.20	0.09	0.85	0.23	-0.12	0.00	-0.05
20	-0.08	0.25	0.27	0.01	0.03	0.81	-0.04
21	-0.18	0.76	-0.25	0.02	-0.38	0.07	-0.00
22	-0.08	0.18	-0.56	-0.17	0.18	0.43	0.48
23	-0.15	-0.50	-0.02	-0.48	0.45	-0.11	0.20
24	-0.02	-0.01	0.09	0.88	0.06	-0.12	0.17
25	0.19	-0.02	-0.19	-0.52	0.34	0.46	0.45
26	0.42	0.12	0.66	0.26	0.08	0.05	0.24

Component IV - Mining/Dealing Status

Loadings +0.7 or higher, variable 24 (% mining).
Loadings +0.4 to +0.69, variable 05 (% heads' children 15+, working).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 03 (servants per household), 25 (% dealing), 23 (% non-kin, loners), 01 (% class I and II) and 15 (% heads, non-local English and Welsh).

Component V - Family Status

Loadings +0.7 or higher, variables 07 (% heads, female) and 12 (% aged 65+).
Loadings +0.4 to +0.69, variables 13 (mean age head) and 23 (% non-kin, loners)
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 11 (% heads with children) and 10 (fertility ratio).

Component VI - Occupied Males (Family Status and Dealing)

Loadings +0.7 or higher, variable 20 (% males gainfully employed).
Loadings +0.4 to +0.69, variables 25 (% dealing), 18 (family nuclei per household) and 22 (% households with non-kin).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 10 (fertility ratio) and 11 (% heads with children).

Component VII - Dealing and Non-kin

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 22 (% households with non-kin), 03 (servants per household) and 25 (% dealing).
Loadings -0.7 or lower, variable 09 (interval fertility measure).
Loading -0.4 to -0.69, absent.

A3.5 Factorial Ecology Of Wolverhampton 1871 By Grid Units: Principal Components Analysis And Oblique Rotation

There were seven components with eigenvalues over 1.0. Table A3.5 shows component loadings and Table A3.6 component correlations.

Component I - (Low) Social Status (Local Manufacturers)

Loadings +0.7 or higher, variables 19 (sex ratio) and 26 (% manufacturing).
Loadings +0.4 to +0.69, variables 04 (% heads' children 5-14, working) 05 (% heads' children 15+, working), 02 (% class IV and V), 10 (fertility ratio) and 14 (% born in Wolverhampton).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 01 (% class I and II).

Component II - Family Status (Dealing)

Loadings +0.7 or higher, variables 12 (% aged 65+) and 07 (% heads, female).
Loadings +0.4 to +0.69, variables 13 (mean age of head), 25 (% dealing), 23 (% non-kin, loners) and 06 (% labour force, female).
Loadings -0.7 or lower, variable 11 (% heads with children).
Loadings -0.4 to -0.69, variables 10 (fertility ratio) and 21 (persons per household).

Table A3.5 Components Loading Matrix: GU1871 Principal Components Analysis and Oblique Rotation

VARIABLES	COMPONENTS						
	I	II	III	IV	V	VI	VII
01	-0.50	0.14	0.38	0.11	-0.34	-0.12	0.15
02	0.42	0.00	-0.71	0.18	-0.05	0.24	0.07
03	-0.09	0.25	0.13	-0.20	-0.53	0.10	0.42
04	0.61	0.14	0.00	0.32	0.08	-0.11	-0.00
05	0.39	-0.15	0.09	0.19	0.52	-0.13	-0.11
06	-0.11	0.31	-0.03	0.80	0.00	0.09	0.02
07	-0.33	0.83	-0.11	0.15	0.10	0.09	0.00
08	0.03	-0.20	0.09	0.88	-0.12	-0.05	0.07
09	-0.10	0.12	0.12	-0.66	-0.21	-0.06	-0.95
10	0.40	-0.43	-0.05	-0.05	0.00	0.52	-0.13
11	-0.05	-0.58	-0.10	-0.01	0.27	0.33	-0.22
12	-0.00	0.80	0.20	0.04	0.06	-0.22	-0.00
13	0.39	0.65	-0.19	-0.09	-0.19	-0.05	-0.09
14	0.21	0.27	-0.12	0.51	0.23	0.23	-0.24
15	-0.01	-0.16	0.23	-0.54	-0.36	-0.17	0.17
16	0.06	0.28	-0.79	-0.19	-0.01	-0.03	0.04
17	0.04	0.01	-0.70	0.46	-0.02	-0.16	0.05
18	-0.00	-0.07	-0.69	0.24	0.09	-0.42	0.14
19	0.87	-0.12	-0.03	-0.25	0.13	-0.09	0.07
20	0.24	0.04	-0.14	-0.09	-0.01	-0.84	-0.07
21	-0.33	-0.36	-0.78	-0.18	-0.02	-0.09	-0.02
22	-0.56	0.18	-0.17	-0.04	-0.05	-0.31	0.37
23	0.09	0.40	0.44	-0.12	-0.40	0.22	0.17
24	0.02	0.14	0.08	-0.12	0.95	0.05	0.23
25	-0.13	0.27	0.02	0.25	-0;46	-0.29	0.38
26	0.62	0.08	-0.05	0.35	0.14	-0.10	-0.15

Table A3.6 Component Correlations After Oblique Rotation

		COMPONENTS						
		I	II	III	IV	V	VI	VII
COMPONENTS	I	1.00000	-0.01553	-0.15193	0.12585	0.26693	0.04664	-0.24075
	II	-0.01553	1.00000	0.05102	0.15492	-0.19534	-0.14873	0.14729
	III	-0.15193	0.05102	1.00000	-0.13582	-0.19540	0.14918	0.02450
	IV	0.12585	0.15492	-0.13582	1.00000	0.18200	-0.02594	-0.08761
	V	0.26693	-0.19534	-0.19540	0.18200	1.00000	0.12827	-0.19535
	VI	0.04664	-0.14873	0.14918	-0.02594	0.12827	1.00000	-0.20539
	VII	-0.24075	0.14729	0.02450	-0.08761	-0.19535	-0.20539	1.00000

Component III - Social Status/(Overcrowding and Ethnicity)

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 23 (% non-kin, loners) and 01 (% class I and II).
Loadings -0.7 or lower, variables 18 (family nuclei per 100 households), 17 (density), 16 (% heads Irish etc.), 02 (% class IV and V) and 21 (persons per household).
Loadings -0.4 to -0.69, absent.

Component IV - Feminism (Local Manufacturers)

Loadings +0.7 or higher, variables 06 (% labour force, female) and 08 (% heads' wives, working).
Loadings +0.4 to +0.69, variables 14 (% born in Wolverhampton), 17 (density), 26 (% manufacturing) and 04 (% heads' children 5-14, working).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 15 (% heads, non-local English or Welsh).

Component V - Occupation Status (Mining/Dealing)

Loadings +0.7 or higher, variable 24 (% mining).
Loadings +0.4 to +0.69, variables 05 (% heads' children 15+, working), 11 (% heads with children) and 14 (% born in Wolverhampton).
Loadings -0.7 or lower, variable 03 (servants per household).
Loadings -0.4 to -0.69, variables 25 (% dealing), 01 (% class I and II), 23 (% non-kin, loners) and 15 (% heads, non-local English or Welsh).

Component VI - Family Status

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 10 (fertility ratio), 11 (% heads with children) and 25 (% dealing).
Loadings -0.7 or lower, variable 20 (% males gainfully employed).
Loadings -0.4 to -0.69, variables 18 (family nuclei per 100 households) and 22 (% households with non-kin).

Component VII - Dealing Prestige/Fertility

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 22 (% households with non-kin), 25 (% dealing) and 03 (servants per household).
Loadings -0.7 or lower, variable 09 (interval fertility measure).
Loadings -0.4 to -0.69, variables 10 (fertility ratio), 14 (% born in Wolverhampton) and 11 (% heads with children).

A3.7 Factorial Ecology Of Wolverhampton 1871 By Grid Units: Principal Components Analysis And Varimax Rotation Using Untransformed Data

Using untransformed data only six components (Table A3.7) had eigenvalues greater than 1.0.

Component I - Family Status (Dealing)

Loadings +0.7 or higher, variable 12 (% aged 65+) and 07 (% heads, female).
Loadings +0.4 to +0.69, variables 13 (mean age of head), 25 (% dealing) and 20 (% males gainfully occupied).
Loadings -0.7 or lower, variable 11 (% heads with children).
Loadings -0.4 to -0.69, variable 10 (fertility ratio).

Table A3.7 Components Loading Matrix: GU1871 Principal Components Varimax Using Untransformed Data

VARIABLES	COMPONENTS					
	I	II	III	IV	V	VI
01	0.23	-0.33	-0.73	-0.10	0.36	0.23
02	-0.09	0.66	0.43	0.27	-0.20	0.13
03	0.31	-0.24	-0.69	-0.17	0.38	0.25
04	0.18	0.07	0.69	0.33	0.04	-0.01
05	-0.23	0.02	0.65	0.26	0.02	-0.33
06	0.25	0.03	-0.01	0.87	0.06	0.09
07	0.74	0.01	-0.27	0.33	-0.05	-0.10
08	-0.09	0.16	0.18	0.72	0.17	0.30
09	0.04	-0.16	0.01	-0.01	-0.65	0.00
10	-0.65	-0.04	0.39	-0.01	-0.45	0.04
11	-0.80	0.09	0.09	0.05	-0.29	-0.24
12	0.86	-0.16	-0.02	0.13	0.00	-0.02
13	0.68	0.19	0.26	-0.00	-0.28	0.23
14	0.09	0.07	0.41	0.67	-0.28	-0.25
15	-0.00	-0.27	-0.26	-0.68	0.19	0.30
16	0.05	0.81	0.05	0.09	-0.01	0.15
17	0.07	0.79	0.12	0.42	0.13	0.02
18	0.12	0.81	0.15	0.15	0.36	-0.16
19	-0.11	0.08	0.86	-0.25	-0.00	0.01
20	0.40	0.44	0.31	-0.27	0.29	0.08
21	-0.29	0.77	-0.26	-0.22	0.06	-0.16
22	0.34	0.19	-0.62	-0.10	0.53	0.08
23	0.36	-0.58	-0.22	-0.09	-0.04	0.49
24	-0.08	-0.04	0.18	-0.06	-0.06	-0.79
25	0.54	0.05	-0.32	-0.02	0.59	0.25
26	0.06	0.10	0.77	0.40	-0.03	-0.04

Component II - Overcrowding and Ethnicity (Low Status)

Loadings +0.7 or higher, variables 18 (family nuclei per 100 households), 16 (% heads Irish etc.), 17 (density) and 21 (persons per household).
Loadings +0.4 to +0.69, variables 02 (% class IV and V) and 20 (% males gainfully occupied).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 23 (% non-kin, loners).

Component III - (Low) Social Status (Local Manufacturers)

Loadings +0.7 or higher, variables 19 (sex ratio) and 26 (% manufacturing).
Loadings +0.4 to +0.69, variables 04 (% heads' children 5-14, working), 05 (% heads' children 15+, working), 02 (% class IV and V) and 14 (% born in Wolverhampton).
Loadings -0.7 or lower, variable 01 (% class I and II).
Loadings -0.4 to -0.69, variables 03 (servants per household) and 22 (% households with non-kin).

Component IV - Feminism (Local Manufacturers)

Loadings +0.7 or higher, variables 06 (% labour force, female) and 08 (% heads' wives, working).
Loadings +0.4 to +0.69, variables 14 (% born in Wolverhampton), 17 (density) and 26 (% manufacturing).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 15 (% heads, non-local English and Welsh).

Component V - Dealing (Household Composition)

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 25 (% dealing) and 22 (% households with non-kin).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 09 (interval fertility measure) and 10 (fertility ratio).

Component VI - Loners/Mining

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variable 23 (% non-kin, loners).
Loadings -0.7 or lower, variable 24 (% mining).
Loadings -0.4 to -0.69, absent.

A3.8 Factorial Ecology Of Wolverhampton By Grid Units: Unweighted Principal Components Analysis And Varimax Rotation

The seven components with eigenvalues exceeding 1.0 accounted for 78.2% of total variance (Table A3.8)

Component I - Feminism (Local Manufacturers)

Loadings +0.7 or higher, variables 06 (% labour force, female) and 08 (% heads' wives, working).
Loadings +0.4 to +0.69, variables 14 (% born in Wolverhampton) and 17 (density).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 15 (% heads, non-local English and Welsh).

Table A3.8 Components Loading Matrix: GU1871 Principle Components Varimax Using Unweighted Data

VARIABLES	COMPONENTS						
	I	II	III	IV	V	VI	VII
01	0.04	-0.29	-0.73	0.14	0.40	-0.17	-0.12
02	0.19	0.65	0.51	0.03	0.06	-0.30	0.04
03	-0.30	-0.07	-0.27	0.30	0.67	-0.03	-0.36
04	0.37	0.03	0.66	0.22	-0.13	0.09	-0.13
05	0.21	-0.13	0.42	-0.30	-0.44	0.26	0.23
06	0.83	0.03	-0.07	0.24	0.03	-0.00	0.18
07	0.33	0.12	-0.30	0.76	-0.03	-0.15	0.02
08	0.81	-0.04	0.04	-0.06	-0.04	0.06	-0.15
09	0.05	-0.09	0.04	-0.00	0.02	-0.05	0.86
10	0.01	-0.03	0.58	-0.36	-0.14	-0.56	0.04
11	-0.05	-0.02	0.23	-0.62	-0.42	-0.31	0.31
12	0.11	-0.20	-0.12	0.79	-0.01	0.26	-0.07
13	-0.07	0.12	0.34	0.66	0.14	0.09	0.10
14	0.57	0.12	0.32	0.13	-0.24	-0.29	0.34
15	-0.55	-0.16	-0.14	-0.11	0.55	0.23	-0.10
16	-0.17	0.76	0.06	0.28	0.01	0.03	0.00
17	0.50	0.74	0.09	-0.01	0.00	0.17	-0.03
18	0.26	0.76	-0.00	-0.05	-0.08	0.43	-0.25
19	-0.23	0.05	0.85	-0.08	-0.06	0.15	-0.09
20	-0.07	0.25	0.18	0.17	0.06	0.72	-0.05
21	-0.26	0.74	-0.20	-0.40	-0.03	0.04	-0.02
22	-0.04	0.28	-0.67	0.16	0.25	0.31	-0.38
23	-0.20	-0.42	-0.05	0.41	0.56	-0.16	0.01
24	-0.08	-0.11	0.12	0.07	-0.82	-0.10	-0.20
25	0.21	0.06	-0.37	0.38	0.48	0.35	0.40
26	0.35	0.05	0.70	-0.02	-0.10	0.17	0.33

Component II - Overcrowding and Ethnicity (Low Status)

Loadings +0.7 or higher, variables 16 (% heads, Irish etc.), 18 (family nuclei per 100 households), 17 (density) and 21 (persons per household).
Loadings +0.4 to +0.69, variable 02 (% class IV and V).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 23 (% non-kin, loners).

Component III - (Low) Social Status (Local Manufacturers)

Loadings +0.7 or higher, variables 19 (sex ratio) and 26 (% manufacturing).
Loadings +0.4 to +0.69, variables 04 (% heads' children 5-14, working), 10 (fertility ratio), 02 (% class IV and V) and 05 (% heads' children 15+, working).
Loadings -0.7 or lower, variable 01 (% class I and II).
Loadings -0.4 to -0.69, absent.

Component IV - Family Status

Loadings +0.7 or higher, variables 12 (% aged 65+) and 07 (% heads, female).
Loadings +0.4 to +0.69, variables 13 (mean age of head) and 23 (% non-kin, loners
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variables 11 (% heads with children) and 21 (persons per household).

Component V - Dealing Prestige (Family Status)/Mining

Loadings +0.7 or higher, absent.
Loadings +0.4 to +0.69, variables 03 (servants per household), 23 (% non-kin, loners), 15 (% heads, non-local English and Welsh), 25 (% dealing), 05 (% heads' children 15+, working) and 01 (% class I and II).
Loadings -0.7 or lower, variable 24 (% mining).
Loadings -0.4 to -0.69, variable 11 (% heads with children).

Component VI - Occupied Males

Loadings +0.7 or higher, variable 20 (% males gainfully occupied).
Loadings +0.4 to +0.69, variable 18 (family nuclei per 100 households).
Loadings -0.7 or lower, absent.
Loadings -0.4 to -0.69, variable 10 (fertility ratio).

Component VII was not interpreted

Loadings +0.7 or higher, variable 09 (interval fertility measure).
Loadings +0.4 to +0.69, absent.
Loadings -0.4 or lower, absent.

Table A3.9 Components Loading Matrix: CHANGE51-61

CHANGE 51-61	COMPONENTS								
VARIABLE	I	II	III	IV	V	VI	VII	VIII	IX
01	0.69	-0.09	0.17	0.02	0.31	-0.22	0.21	-0.17	0.21
02	-0.11	-0.28	-0.02	-0.04	0.12	0.33	-0.02	0.69	0.34
03	0.85	-0.02	-0.22	0.03	-0.00	0.11	-0.08	0.13	0.23
04	-0.07	0.11	-0.10	0.05	-0.07	-0.03	0.00	0.80	-0.24
05	-0.68	0.04	0.09	-0.12	-0.06	0.02	0.25	0.37	-0.01
06	-0.21	-0.10	0.81	-0.10	0.26	0.06	-0.01	-0.22	0.16
07	-0.05	0.05	0.83	0.01	-0.05	-0.26	0.10	0.04	-0.06
08	-0.36	0.07	0.00	0.07	0.72	-0.03	-0.05	-0.19	0.03
09	0.08	-0.38	-0.14	0.32	-0.00	0.01	-0.67	-0.11	0.12
10	-0.43	-0.05	-0.11	0.65	-0.21	-0.06	0.24	-0.32	0.00
11	0.00	-0.14	-0.02	0.15	-0.05	0.06	0.83	-0.09	-0.14
12	0.42	0.27	0.36	0.34	-0.24	0.38	-0.20	0.24	-0.06
13	0.55	0.21	0.60	-0.07	-0.18	0.28	-0.04	0.14	-0.04
14	-0.09	-0.05	0.03	0.29	-0.19	-0.26	0.70	-0.00	0.22
15	0.04	-0.05	-0.10	-0.03	0.12	0.93	-0.05	0.03	-0.06
16	0.22	0.04	0.02	0.83	0.22	-0.08	0.05	0.17	-0.02
17	-0.04	0.72	-0.00	0.16	-0.10	-0.15	0.08	0.10	0.32
18	-0.17	0.76	0.11	-0.31	0.07	-0.00	-0.24	-0.01	-0.32
19	-0.55	0.40	-0.23	0.22	0.24	0.25	-0.10	-0.12	-0.01
20	0.00	0.06	0.15	-0.59	-0.04	-0.33	-0.14	0.56	-0.16
21	-0.00	0.90	-0.07	-0.07	-0.07	0.12	0.02	0.00	0.02
22	0.34	0.54	-0.23	-0.07	0.53	0.10	-0.11	0.08	0.04
23	0.23	-0.67	-0.23	-0.19	-0.06	0.18	-0.06	0.10	0.17
24	-0.12	0.00	-0.03	-0.02	0.01	0.05	0.07	0.12	-0.86
25	0.25	-0.17	0.13	0.08	0.73	0.18	-0.16	0.15	-0.07
26	-0.74	0.32	0.19	-0.05	0.12	-0.26	0.02	0.22	0.26

Table A3.10 Components Loading Matrix: CHANGE61-71

CHANGE 61-71	COMPONENTS									
VARIABLE	I	II	III	IV	V	VI	VII	VIII	IX	X
01	0.80	-0.14	0.05	-0.07	-0.02	-0.06	0.05	-0.21	-0.30	-0.08
02	-0.18	-0.03	-0.02	0.00	0.00	0.03	-0.00	0.05	0.85	0.18
03	0.86	0.08	-0.05	-0.01	-0.06	-0.04	-0.20	-0.07	0.14	-0.02
04	-0.01	-0.08	-0.00	0.64	-0.11	0.00	-0.02	0.09	-0.02	0.08
05	-0.63	-0.01	0.01	-0.08	0.11	0.38	0.09	0.09	0.12	-0.22
06	-0.18	-0.21	-0.00	-0.43	-0.00	0.09	-0.13	0.61	-0.07	0.34
07	0.16	-0.37	-0.30	0.30	0.29	0.18	0.12	0.17	-0.46	0.40
08	-0.02	-0.17	0.05	-0.02	-0.10	0.43	0.03	0.69	0.11	-0.16
09	0.03	-0.01	0.06	0.11	-0.14	-0.00	-0.13	0.12	0.17	0.78
10	-0.00	0.14	-0.82	-0.08	0.09	-0.24	-0.07	0.07	-0.06	-0.02
11	0.07	0.80	-0.21	-0.03	-0.10	0.06	0.21	-0.13	-0.20	-0.03
12	0.05	-0.37	0.71	-0.10	0.08	-0.20	-0.09	0.20	-0.10	0.07
13	0.26	0.24	0.63	0.18	-0.22	0.29	0.02	0.26	0.00	-0.05
14	-0.07	0.43	-0.06	0.36	0.14	0.56	-0.12	0.12	0.16	0.04
15	-0.19	0.19	0.08	-0.07	-0.01	-0.12	0.83	0.10	-0.15	0.04
16	0.12	0.02	-0.12	-0.34	0.03	0.18	-0.05	-0.74	-0.01	-0.20
17	-0.13	0.37	-0.03	-0.40	0.33	-0.02	0.30	-0.34	0.17	0.45
18	-0.16	0.07	-0.04	-0.09	0.87	-0.09	-0.04	-0.12	0.08	-0.03
19	-0.03	-0.12	-0.11	0.07	-0.16	0.25	0.70	-0.14	0.20	-0.34
20	-0.29	-0.00	0.51	0.70	0.12	-0.03	-0.04	-0.09	-0.02	0.03
21	0.10	0.80	-0.06	-0.15	0.35	-0.07	-0.07	-0.11	0.13	0.02
22	0.60	0.03	0.13	-0.22	0.65	0.00	0.01	-0.00	0.01	-0.03
23	0.37	-0.10	0.16	-0.18	-0.72	-0.00	0.11	-0.05	0.23	0.08
24	0.08	-0.17	-0.14	0.48	0.22	-0.61	0.24	0.01	0.25	-0.13
25	0.69	0.21	0.13	-0.05	-0.28	-0.11	-0.04	0.18	-0.22	-0.00
26	-0.30	-0.11	0.20	-0.04	-0.06	0.77	0.14	0.03	0.00	-0.01

REFERENCES

Abu Lughod, J. (1963) Urban-rural differences as a function of demographic transition: Egyptian data and an analytical model, Am. J. Sociol. 69, 476-90.

_____ (1965) The emergence of differential fertility in urban Egypt, Millbank Memorial Fund Quarterly 43, 235-53.

_____ (1968) A critical test for the theory of Social Area Analysis: the factorial ecology of Cairo, Egypt, Dept. of Sociol. paper Northwestern University cited in Berry, B.J.L. and Horton, F.E., 1970, Geographic Perspectives on Urban Systems, Englewood Cliffs, 318.

_____ (1969) Testing the theory of social area analysis: the ecology of Cairo, Egypt, Am. Soc. Rev. 34, 189-212.

Adelman, I. and Morris, C.T. (1975) Technology and the distribution of income: the evidence from history, I.T.C.C. Review 4(16), 1-28.

Alihan, M.A. (1938) "Community" and ecological studies, in Social Ecology, New York, 1961, 93-97.

Alker, H.R. (1969) A typology of ecological fallacies, in Dogan, M. and Rokkan, S. (Eds.) Quantitative Ecological Analysis in the Social Sciences, Cambridge, Mass., 69-86.

Allardt, E. (1969) Aggregate analysis: the problem of its information value, in Dogan M. and Rokkan, S. op. cit., 41-51.

Allen, G.C. (1929) Methods of industrial organization in the West Midlands 1860-1927, Ec. Hist. 1, 535-553.

Alonso, W. (1964 a) The historical and the structural theories of urban form, Land Econ. 40, 227-231.

_____ (1964 b) The form of cities in developing countries, Papers and Proc. Reg. Sc. Assoc. 13, 165-173.

Anderson, M. (1971) Family Structure in Nineteenth Century Lancashire, Cambridge.

_____ (1972a) The study of family structure, in Wrigley E.A. (Ed.) Nineteenth Century Society, Cambridge, 47-81.

_____ (1972b) Standard tabulation procedures for the census enumerators' books 1851-1891, ibid., 134-145.

Anderson, N. (1959-60) Urbanism and urbanization, Am. J. Sociol. 65, 68.

Anderson, T.R. and Bean, L. (1961) The Shevky-Bell social areas: confirmation of results and a re-interpretation, Social Forces 40, 119-124.

Anderson, T.R. and Egeland, J. (1961) Spatial aspects of social area analysis, Am. Soc. Rev. 26, 392-398.

Armstrong, W.A. (1966) Social Structure from the early census returns, in Eversley et al. (Eds.) An Introduction to English Historical Demography, London.

_____ (1967) The Social Structure of York, 1841-51: an essay in quantitative history, Unpubl. Ph.D. thesis, Birmingham University.

_____ (1968a) The interpretation of census enumerators' books for Victorian towns, in Dyos, H.J. (Ed.) The Study of Urban History, London.

_____ (1968b) Rejoinder, Ec. Hist. Rev. 2nd Ser. 21, 609-613.

_____ (1972) The use of information about occupation, in Wrigley, E.A. (Ed.) Nineteenth Century Society, Cambridge, 191-310.

Ashworth, W. (1954) The Genesis of Modern British Town Planning, London.

Avery, F. (1948) The Book of the Century, Manchester.

Banks, J.A. (1954) Prosperity and Parenthood, London.

Bardet, G. (1951) Social topography: an analytico-synthetic understanding of the urban texture, T.P.R. 22, 237-260.

Bell, W. (1958) The utility of the Shevky typology for the design of urban sub-area field studies, J. Social Psychol. 47, 71-83.

_____ (1968) The city, the suburb and a theory of social choice, in Grear S. et al (Eds.) The New Urbanization, New York, 132-168.

Beresford, M.W. (1971) The back-to-back house in Leeds, 1787-1937, in Chapman, S.D. (Ed.) The History of Working-Class Housing: a symposium, London, 93-132.

Berry, B.J.L. (1965) Internal structure of the city, Law and Contemp. Problems 30, 111-119.

_____ (1971)(Ed.) Comparative factorial ecology, E.G. 47, Supplement.

_____ (1973) The Human Consequences of Urbanisation, London.

Berry, B.J.L. and Rees, P.H. (1968) The factorial ecology of Calcutta, Am. J. Sociol. 74, 445-491.

Beshers, J.M. (1967) Population Processes in Social Systems, New York.

Beshers, J.M. et al. (1964) Ethnic congregation - segregation, assimilation and stratification, Social Forces 42, 482-489.

Beshers, J.M. and Nishiura, E.N. (1961) A theory of internal migration differentials, Social Forces 39, 214-218.

Best, G. (1973) Mid-Victorian Britain 1851-75, St. Albans.

Best, R.H. and Champion, A.G. (1970) Regional conversions of agricultural land to urban uses in England and Wales, 1945-67, Trans. I.B.G. 49, 15-32.

Beucheley, R.W. (1956) Review of 'Social Area Analysis', J. Am. Stat. Assoc. 51, 195-197.

Beynon, E.D. (1937) The morphology of the cities of the Alföld, G.R. 27, 328-329.

_____ (1943) Budapest: an ecological study, G.R. 33, 256-275.

Black, C. (1891) Labour and life in London, Contemporary Review 60, 207-219.

Blackmore, J.S. and Mellonie, F.C. (1926-29) Family endowment and the birth rate in the early nineteenth century, Ec. Hist. 1, 205-213 and 412-418.

Blumenfeld, H. (1954) The tidal wave of metropolitan expansion, J. Am. Instit. Planners 20, 3-14.

Boal, F.W. (1972) The urban residential sub-community: a conflict interpretation, Area 4, 164-168.

Boal, F.W. and Johnson, D.B. (1965, reprinted 1971) The function of retail and service establishments on commercial ribbons, Canadian Geographer 9, 154-169 in Bourne, L.S. (Ed.) Internal Structure of the City, London, 368-379.

Bogue, D.J. (1959) Internal migration, in Hauser, P.M. and Duncan, O.D. (Eds.) The Study of Population, Chicago, 486-509.

Boundary Commissioners for England and Wales, Report 1868, B.P.P. 1867-1868, XX, 783.

Bourne, L.S. and Barber, G.M. (1971) Ecological patterns of small urban centres in Canada, E.G. 47, 258-265.

Braithwaite, R.B. (1968) Scientific Explanation: a study of the function of theory, probability and law in science, Cambridge.

Bridgen and Co., (1838) Directory of the Borough of Wolverhampton, available in Wolverhampton Central Library.

_____ (1847) Wolverhampton Post Office Directory, available in Wolverhampton Central Library.

Brigham, E.F. (1965, reprinted 1971) The determinants of residential land values, Land Econ., 41, 325-334 in Bourne, L.S. (Ed.) Internal Structure of the City, London, 160-169.

Brown, L.A. and Horton, F.E. (1970) Social area change: an empirical analysis, Urban Studies 7(3), 271-288.

Brown, L.A. and Moore, E.G. (1970) The intra-urban migration process: a perspective, Geografiska Annales, 52B (i).

Brown, W.H. (1972) Access to housing: the role of the real estate industry, E.G. 48, 66-78.

Buckley, W. (1958) Social stratification and the functional theory of social differentiation, Am. Soc. Rev. 23, 369-375.

Burgess, E.W. (1925) The growth of the city: an introduction to a research project, in Park, R.E. et al. (Eds.) The City, Chicago, 47-62.

_____ (1927) The determination of gradients in the growth of the city, Publs. Am. Sociol. Soc. 21, 178-184.

_____ (1929) Urban areas, in Smith T.V. and White, L.D. (Eds.) Chicago: an experiment in social science research, Chicago, 114-123.

Burgess, E.W. and Bogue, D.J. (Eds.)(1963) Contributions to Urban Sociology, Chicago.

Burn, W.L. (1964) The Age of Equipoise, London.

Burrows, H.L. (1914) 7th Edition (1963) The Story of English Industry and Trade, London.

Burrows, J. (Ed.)(1953?) The County Borough of Wolverhampton: official handbook, Cheltenham and London; no date.

_____ (Ed.)(1958?) The County Borough of Wolverhampton: the official handbook, Cheltenham and London; no date.

Bythell, D. (1969) The Handloom Weavers: a study in the English cotton industry during the Industrial Revolution, Cambridge.

Camillieri, S.F. (1962) Theory, probability and induction in social research, Am. Soc. Rev. 27, 170-178.

Cant, R.G. (1971) Changes in the location of manufacturing in New Zealand 1957-68: an application of three-mode factor analysis, New Zealand Geographer 27, 38-55.

Caplow, T. (1952) Urban structure in France, Am. Soc. Rev. 17, 544-549.

Carter, H. (1972) The Study of Urban Geography, London.

Chambers, J.D. (1957) The course of population change in 'The Vale of Trent 1670-1800 .....', Ec. Hist. Rev. Suppl. 3.

_____ (1960) Population changes in a provincial town: Nottingham 1700-1800, in Pressnell, L.S. (Ed.) Studies in the Industrial Revolution, London.

Chapin, F.S. (1964) Selected theories of urban growth and structure, J. Am. Instit. Planners 30, 51-59.

_____ (1968) Activity systems and urban structure: a working scheme, J. Am. Instit. Planners 34, 11-18.

Chapman, S.D. (1971) Working-class housing in Nottingham during the Industrial Revolution, in The History of Working-class Housing: a symposium, London, 133-163.

Chapman, S.D. and Bartlett, J.N. (1971) The contribution of building clubs and freehold land society to working-class housing in Birmingham, in Chapman, S.D. (Ed.) op. cit., 221-246.

Children's Employment Commissioners, Fifth Report (1982) B.P.P. 1866 XXIV, 180-181.

Chorley, R.J. (1964) Geography and analog theory, A.A.A.G. 54, 127-137.

Chorley, R.J. and Hagget, P. (1967) Models in Geography.

Chung, R. (1970) Space-time diffusion of the transition model: the twentieth century patterns, in Demko, G.J. et al. (Ed.) Population Geography, New York.

Clark, C. (1953) The Conditions of Economic Progress, Second Edition, London.

Clark, D. (1973) Normality, transformation and the principal components solution: an empirical note, Area 5(2), 110-113.

Clark, D. et al. (1973) The application of factor analysis in geography, Draft paper presented to I.B.G. Quantitative Methods Study Group Conference at Newcastle.

Clinker, C.R. (1954) Railways of the West Midlands: a chronology 1808-1954, London.

Commissioners on the State of Large Towns, First Report (1844) B.P.P. Health General 5, reprint Shannon, 1970.

_____, Second Report (1845) B.P.P. Health General 6, reprint Shannon, 1970.

Committee on Poor Removal, Report (1854) B.P.P. Poor Law 22, reprint Shannon, 1970, Appendix 15, 613-662.

Conzen, M.R.G. (1960) Alnwick, Northumberland: a study in town plan analysis, Trans. I.B.G., 27.

Coulson, M.R.C. (1968) The distribution of population age structure in Kansas City, A.A.A.G. 58, 155-176.

Cowgill, D.O. (1963, reprinted 1970) Transition theory as general population theory, Social Forces 41, 270-274, reprinted in Ford, T.R. and De Jong, G.F. Social Demography, Englewood Cliffs, N.J., 627-633.

Cox, R.W.C. (1965) The Development of Croydon in the Nineteenth and Twentieth Centuries, Unpubl. M.A. thesis, Leicester University.

Craven, E. (1969) Private residential expansion in Kent, 1954-1964: a study of pattern and process in urban growth, Urban Studies 6, 1-16.

Cullingworth, J.B. (1960) Housing Needs and Planning Policy, London.

Curl, J.S. (1972) European Cities and Society, London.

Dahrendorf, R. (1959) Class and Class Conflict in An Industrial Society, London.

Dansereau, H.K. (1961) Some implications of modern highways for community ecology, in Theodorson, G.A. (Ed.) Studies in Human Ecology, New York, 175-187.

Davie, M.R. (1938) The pattern of urban growth, in Murdock, G.P. (Ed.) Studies in the Science of Society, New Haven, 133-161.

Davies, V.L. and Hyde, H. (1970) Dudley and the Black Country 1760 to 1860, Co. Borough of Dudley Libraries Typescript 16.

Davies, W.K.D. (1966) Theory, science and geography, Tidjschrift voor Ec. Soc. Geog. 57, 125-130.

_____ (1971) Varimax and the destruction of generality, Area 3(2), 112-118.

_____ (1973) Problems in applied factor analysis: a framework for discussion, Paper presented at I.B.G. Annual Conference, Birmingham.

Davies, W.K.D. et al (1968) Directories, rate books and the commercial structure of towns, Geography 53, 41-54.

Davis, K. and Moore, W. (1945) Some principles of stratification, Am. Soc. Rev. 10, 242-249.

Deane, P. and Cole, W.A. (1962) British Economic Growth 1688-1959: trends and structure, Cambridge.

Dehane, J. (1840) On the sanitary condition of the town of Wolverhampton, Sanitary Inquiry England B.P.P. Health 3, (Shannon reprint 1971), 862-868.

Dennis, R.J. (1974) Patterns of social interaction in Victorian cities, Paper presented to I.B.G. Historical Geography Conference, Windsor.

Dickinson, G.C. (1959-60) The development of suburban road passanger transport in Leeds 1840-95, J. Transp. Hist. 4, 214-223.

Drake, M. (1972) The census, in Wrigley, E.A. (Ed.) Nineteenth Century Society: essays in the use of quantitative methods for the study of social data, Cambridge, 7-46.

Duncan, B. (1956) Factors in work-residence separation: wage and salary workers, Chicago 1951, Am. Soc. Rev. 21, 48-56.

Duncan, B. et al. (1961-2) Patterns of city growth, Am. J. Sociol. 67, 418-429.

Duncan, O.D. (1955) Review of 'Social Area Analysis', Am. J. Sociol. 61, 84-85.

_____ (1959) Residential segregation and social differentiation, International Population Conference, Vienna, 571-577.

Duncan, O.D. and Davis, B. (1953) An alternative to ecological correlation, Am. Soc. Rev. 18, 665-666.

Duncan, O.D. and Duncan, B. (1955) Residential distribution and occupational stratification, Am. J. Sociol. 60, 493-506.

Duncan, O.D. and Lieberson, S. (1959) Ethnic segregation and assimilation, Am. J. Sociol. 64, 364-374.

Dunlop, J.C. (1916) Note as to error of statement of ages of young children in a census, J. Royal Stat. Soc. 79, 309-317.

Durkhiem, E. (1947) The Division of Labor in Society, Glencoe.

Dyos, H.J. (1953) Workmen's fares in south London 1860-1914, J. Transp. Hist. 1(1), 3-19.

_____ (1955) Railways and housing in Victorian London: Attila in London, J. Transp. Hist. 2, 11-21.

_____ (1961) Victorian Suburb: a study of the growth of Camberwell, Leicester.

_____ (1968) Agenda for urban historians, Chapter 1 of The Study of Urban History, London.

Eichenbaum, J. and Gale, S. (1971) Form, function, and process: a methodological enquiry, E.G. 47, 525-544.

Eisenstadt, S.N. (1964) Social change, differentiation and evolution, Am. Soc. Rev. 29, 375-386.

Engels, F. (1844, reprinted 1969) The Condition of the Working Class in England, St. Albans.

Erikson, E.G. (1949) Review of 'The Social Areas of Los Angeles', Am. Soc. Rev. 14, 699.

Evans, I.S. et al. (1975) Special transformations are necessary, University of Durham, Geography Dept., Census Research Unit, Working Paper 2.

Evans, R.J. (1968) The Victorian Age 1815-1914, 2nd Edition, London.

Eversley, D.E.C. (1963) Mortality in Britain in the eighteenth century: problems and prospects, Paper 20, Conference on Historical Demography, Liege.

_____ (1965) Population, economy and society, in Glass, D.V. and Eversley, D.E.C. (Eds.) Population in History, Chicago, 23-69.

Farley, R. (1969) The changing distribution of negroes within metropolitan areas: the emergence of black suburbs, Am. J. Sociol. 75, 512-529.

Faunce, W.A. and Clelland, D.A. (1967) Professionalization and stratification patterns in an industrial community, Am. J. Sociol. 72, 341-350.

Firey, W. (1945) Sentiment and symbolism as ecological variables, Am. Soc. Rev. 10, 140-148.

Flinn, M.W. (1970) British Population Growth 1700-1850, London.

Floud, R.C. and Schofield, R.S. (1968) Social structure from the early census returns, Ec. Hist. Rev. 2nd Ser. 21, 607-609.

Ford, T.R. and De Jong, G.F. (1963) The decline of fertility in the Southern Appalachian mountain region, Social Forces 42, 89-96.

Form, W.H. (1954) The place of social structure in the determination of land use, Social Forces 32, 317-323.

Form, W.H. et al. (1954) The comparability of alternative approaches to the delimitation of urban sub areas, Am. Soc. Rev. 19, 434-440.

Forster, C.R. (1972) Court housing in Kingston upon Hull, Univ. of Hull Occ. Papers in Geography No. 19.

Foster, J. (1968) Nineteenth century towns: a class dimension, in Dyos, H.J. (Ed.) The Study of Urban History, London.

Freedman, R. (1961-2) The sociology of human fertility, Current Sociology 10-11, 35-68.

_____ (1963) Cityward migration, urban ecology and social theory, in Burgess, E.W. and Bogue, D.J. (Eds.) Contributions to Urban Sociology, Chicago, 178-200.

General Board of Health, Report 1850, Report by Dr. Sutherland, B.P.P. Health, Infectious Diseases 1 (reprint Shannon, 1971), 377-554.

Gettys, W.E. (1940) Human ecology and social theory, Social Forces 18, 469-476.

Gibbs, J.P. and Martin, W.T. (1958) Urbanization and natural resources: a study in organizational ecology, Am. Soc. Rev. 23, 266-277.

Giggs, J.A. and Mather, P.M. (1975) Factorial ecology and factor invariance, Economic Geography 51, 366-382.

Gittus, E. (1964-5) An experiment in the definition of urban sub-areas, Trans. Bartlett Soc. 9, 109-135.

Goheen, P.G. (1970) Victorian Toronto, 1850-1900: pattern and process of growth, Univ. Chicago Dept. of Geog. Research Paper No. 127.

Goode, W.J. (1964) The Family, Englewood Cliffs N.J.

Goodman, L.A. (1958-9) Some alternatives to ecological correlation, Am. J. Sociol. 64, 610-625.

Gordon, G. (1970) The Status Areas of Edinburgh: a historical analysis, Unpublished Ph.D. thesis, Edinburgh University.

Greenfield, S.M. (1961) Industrialization and the family in sociological theory, Am. J. Sociol. 67, 312-322.

Greenslade, M.W. and Stuart, D.G. (1965) A History of Staffordshire, Beaconsfield.

Grigsby, W.G. (1963) Housing Markets and Public Policy, Philadelphia.

Guest, A.M. (1971) Retesting the Burgess zonal hypothesis: the location of white collar workers, Am. J. Sociol. 76, 1094-1108.

_____ (1972) Urban history, population densities and higher status residential location, E.G. 48, 375-387.

Habakkuk, H.J. (1953) English population in the eighteenth century, Ec. Hist. Rev. 6, 117-133.

_____ (1958) The economic history of modern Britain, J. Econ. Hist. 18, 486-501.

Haggerty, L.J. (1971) Another look at the Burgess hypothesis: time as an important variable, Am. J. Sociol. 76, 1084-1093.

Hammond, B.L. (1926-9) Urban death rates in the early nineteenth century, Ec. Hist. 1, 419-428.

Handlin, O. (1963) The modern city as a field of historical study, in Handlin, O. and Burchard, J. (Eds.) The Historian and the City, M.I.T.

Harman, H.H. (1960) Modern Factor Analysis, Chicago.

Harris, C.D. and Ullman, E.L. (1945) The nature of cities, Annals Am. Acad. of Pol. and Soc. Sc., 7-17.

Harrison, J.F.C. (1973) The Early Victorians 1832-51, St. Albans.

Harvey, D. (1969) Explanation in Geography, London.

Hauser, F.L. (1951) The ecological pattern of four European cities and two theories of urban expansion, J. Am. Instit. Planners 16, 111-129.

Hawley, A.H. and Duncan, O.D. (1957) Social area analysis: a critical approach, Land Economics 33, 337-345.

Haynes, K.E. (1971) Spatial change in urban structure: alternative approaches to ecological dynamics, E.G. 47, 324-335.

Herbert, D. (1972) Urban Geography: a social perspective, Newton Abbot.

Holland, J. (1858) The progress and spirit of physical science, Edinburgh Rev. 108.

Hollingshead, A.B. (1947) A Re-examination of ecological theory, Sociology and Social Research 31, 194-204.

Houghton, W.E. (1957) The Victorian Frame of Mind, London.

Hoyt, H. (1939) The Structure and Growth of Residential Neighbourhoods in American Cities, Washington.

Hunt, C.L. (1965) Female occupational roles and urban sex ratios in the U.S., Japan and the Philippines, Social Forces 43, 407-417.

Hunter, A. (1971) The ecology of Chicago: persistence and change 1930-60, Am. J. Sociol. 77, 425-444.

Inspector of Constabulary, Report 1868, B.P.P. 1868-9, XXXI.

Inspector of Mines, Reports 1865, B.P.P. 1867, XVI, 608-622.

Jacobs, J. (1967) Self-generating growth of cities, J. Royal Instit. Brit. Archit. 74, 95-100.

Janson, C-G (1971) A preliminary report on Swedish urban spatial structure, E.G. 37, 249-257.

Jefferies, R. (1880) Hodge and His Masters, cited in Best, G. (1973) Mid-Victorian Britain 1851-75, St. Albans, 273.

Jennings, J.R.G. (1966) Mansfield: the evolution of an urban landscape, Unpublished Ph.D. thesis, University of Nottingham.

Johnston, R.J. (1971a) Urban Residential Patterns: an introductory review, London.

_____ (1971b) Some limitations of factorial ecologies and social area analysis, E.G. 47, 314-323.

_____ (1972) Activity spaces and residential preferences: some test of the hypothesis of sectoral maps, E.G. 48, 199-211.

_____ (1973) Social area change in Melbourne 1961-66: a sample exploration, Australian Geog. Studies 11, 79-98.

Jonassen, C.T. (1949) Cultural variables in the ecology of an ethnic group, Am. Soc. Rev. 14, 32-41.

Jones and Co (1962-3) Trades Directory for Wolverhampton, (available in Wolverhampton Central Library).

Jones, E. (1960) A Social Geography of Belfast, London.

_____ (1972) The nature and scope of social geography, Unit 9 in Social Geography, Milton Keynes, 15-23.

Jones, J. (1866) Report on the iron trade of South Staffordshire, in Timmins, S. (Ed.) Birmingham and the Midland Hardware District, reprinted London (1967), 54-76.

Jones, W.H. (1903) Story of the Municipal Life of Wolverhampton, London.

Kaine, J.F. (1962) The journey to work as a determinant of residential location, Papers Reg. Sc. Assoc. 9, 137-160.

Kaiser, E.J. and Weiss, S.F. (1970) Public policy and the residential development process, J. Am. Instit. Planners 36, 30-37.

Kellet, J.R. (1969) The Impact of Railways on Victorian Cities, London.

Kelly and Co. (1845) Post Office Directory of Birmingham, Warwickshire and part of Staffordshire, (available Birmingham Referecen Library).

_____ (1860) Post Office Directory of Birmingham, Staffordshire, Warwickshire and Worcestershire, (available in Birmingham Reference Library).

Keyfitz, N. (1953) A factorial arrangement of comparisons of family size, Am. J. Sociol. 58, 470-479.

Kiang, Y-C. (1968) The distribution of ethnic groups in Chicago 1960, Am. J. Sociol. 74, 292-295.

King, L. (1969) Statistical Analysis in Geography, Englewood Cliffs, N.J.

Krause, J.T. (1958-9) Changes in English fertility and mortality 1781 to 1850, Ec. Hist. Rev. 2nd Ser. 11, 52-70.

Kunkel, J.H. (1967) Some behavioural aspects of the ecological approach to social organization, Am. J. Sociol. 73, 12-29.

Lampard, E. (1965) Historical aspects of urbanization, in Hauser, P.M. and Schnore, L.F. The Study of Urbanization, New York.

Landecker, W.S. (1960) Class boundaries, Am. Soc. Rev. 25, 868-877.

Langer, W. (1963) Population growth and increase in the means of subsistence, Am. Hist. Rev. 69, 1-17.

Langton, J. (1975) Residential patterns in pre-industrial cities: some case studies from seventeenth century Britain, Trans. I.B.G. 65, 1-28.

Lawton, R. (1955) The population of Liverpool in the mid-nineteenth century, Trans. Hist. Soc. of Lancs. and Ches. 107, 89-120.

_____ (1958) Population movements in the West Midlands 1841-1861, Geography 43, 164-177.

_____ (1972) An age of great cities, T.P.R. 43, 199-224.

Lawton, R. and Pooley C.G. (1973) Methodological problems in the statistical analysis of small area data, Social Geography of Nineteenth-Century Merseyside Project, Working Paper No. 2.

_____ (1975) Individual appraisals of nineteenth century Liverpool, Social Geography of Nineteenth-Century Merseyside Project, Working Paper No. 3.

Lees, L.H. (1969) Patterns of lower-class life: Irish slum communities in nineteenth century London, in Thernstrom, S. and Sennet, R. (Eds.) Nineteenth Century Cities, New Haven, 359-385.

_____ (1972) From the history of cities to the history of society, Urban Social Change Rev. 6, 28-32.

Lewis, B. (1848) Topographical Dictionary.

Lewis, O. (1965) Further observations on the folk-urban continuum and urbanization, in Hauser, P.M. and Schnore, L.F. (Eds.) The Study of Urbanization, New York, 491-509.

Lipset, S.M. (1967) Value patterns, class and the democratic polity, in Bendix, R. and Lipset, S.M. (Eds.) Class, Status and Power: social stratification in comparative perspective, London, 161-171.

Litwak, E. (1960) Geographical mobility and extended family cohesion, Am. Soc. Rev. 25, 386-394.

Loveridge, H. (1866) Wolverhampton Trades, in Timmins, S. (Ed.) Birmingham and Midland Hardware Districts, London, 117-124.

Lowry, I.S. (1960) Filtering and housing standards: a conceptual analysis, Land Econ. 36, 362-370.

Low, S.J. (1891) The rise of the suburbs, Contemporary Rev. 60, 545-558.

Lynch, K. and Rodwin, L. (1958) A theory of urban form, J. Am. Instit. Planners 24, 201-14.

Mabry, J.H. (1958) Census tract variation in urban research, Am. Soc. Rev. 23, 193-196.

Macdonald, J.A. and Macdonald, L. (1964) Chain migration, ethnic neighbourhood formation and social networks, Millbank Memorial Fund Quarterly 42, 82-97.

Mann, P.H. (1965) An Appreach to Urban Sociology, London.

Marshall, T.H. (1929) The population problem during the Industrial Revolution, Ec. Hist 1, 429-456.

Mather, P.M. (1973) Recent advances in factor analysis, Paper presented at I.B.G. Annual Conference, Birmingham.

Mathie, R. (1973) The evolution of high status residential areas, Drumlin 2(9), 26-30.

Mawson, J. (1972) A Social Geography of a Nineteenth Century Industrial City, Unpublished dissertation, U.C. London.

McElrath, D.C. (1962) The social areas of Rome: a comparative study, Am. Soc. Rev. 27, 376-377.

_____ (1968) Societal scale and social differentiation, in Greer, S. et al. (Eds.) The New Urbanization, New York, 33-52.

McKeown, T. and Brown, R.G. (1955) Medical evidence related to English population in the eighteenth century, Pop. Studs. 9, 119-141.

McKeown, T. and Record, R.G. (1962-3) Reasons for the decline of mortality in England and Wales during the nineteenth century, Pop. Studs. 16, 94-122.

Medawar, P.B. (1969) Induction and Intuition in Scientific Thought, London.

Medical Officer to the Privy Council, Eighth Report 1866, B.P.P. 1866, XXXIII, 586-588.

Michelson, W. (1970) Man and his Urban Environment: a sociological approach, Reading, Mass.

Midland Mining Commission, First Report 1843, B.P.P. Mining Districts 1, (reprint, Shannon, 1971), 27-316.

Miller, V. (1963) The areal distribution of tax delinquency in Chicago, in Burgess, E.W. and Bogue, D.J. Contributions to Urban Sociology, Chicago, 100-111.

Mill, J.S. (1869, reprint 1912) The subjection of women, in On Liberty, Representative Government, The Subjection of Women, World's Classes, London, Chapter 1.

Mill, J.S. (reprint 1942) The Spirit of the Age: The Examiner Jan-May 1831, reprinted, von Hayek, F.A. (Ed.), Chicago.

Mills, D. (1973) Suburban and ex urban growth, in The Spread of Cities, Open Univ. Block 6, Unit 24, Milton Keynes.

Moore, W.E. (1965) The Impact of Industry, Englewood Cliffs, N.J.

Morrill, R.L. (1965, reprint 1969) The negro ghetto: problems and alternatives, G.R. 55, 339-361, reprinted in Ambrose, P. Analytical Human Geography, London, 258-281.

Mortimore, M. (1960) Urban Growth in Bradford and its Environs, Unpublished M.A. thesis, Leeds University.

Morton, G.R. and Le Guillou, M. (1967) The rise and fall of the South Staffordshire pig iron industry, British Foundryman 60, 269-284.

Mumford, L. (1966) The City in History, Harmondsworth.

Murdie, R.A. (1969) Factorial ecology of metropolitan Toronto 1951-1961: an essay on the social geography of the city, Univ. Chicago Dept. of Geog. Res. Paper 116.

Myers, J.K. (1950) Assimilation to the ecological and social systems of a community, Am. Soc. Rev. 15, 367-372.

_____ (1954) Note on the homogeneity of census tracts, Social Forces 32, 364-366.

Nie, N. et al. (1970) Statistical Package for the Social Sciences.

Oman, C.W. (1899) England in the Nineteenth Century, London.

Openshaw, S. (1973) An empirical study of scale on principal component and factorial studies of spatial association, Paper to Institute of British Geographers Conference, Birmingham.

Openshaw, S. and Gillard, A. (1976) An empirical study of the effects of various operational decisions on a spatial classification of census enumeration district data, Paper to Institute of British Geographers Population and Quantitative Study Groups Conference, Sheffield.

Osborne, J.W. (1970) The Silent Revolution: the Industrial Revolution in England as a source of cultural change, New York.

Parish, W.L. and Schwartz, M. (1972) Household complexity in nineteenth century France, Am. Soc. Rev. 37, 154-173.

Park,R.E. (1952) Human Communities: The City and Human Ecology, reprinted in New York.

Parsons, T. (1966) Societies: evolutionary and comparative perspectives, Englewood Cliffs, N.J.

Parsons, T. and Shils, E.A. (1951) Towards a General Theory of Action, Cambridge, Mass.

Peach, G.C.K. (1968) Urbanization in India, in Beckinsale, R.P. and Houston, J.M. (Eds.) Urbanization and its Problems, Oxford.

Perry, E. (1850) The tinmen's "strike". Letter to Robinson, G., Wolverhampton, (Wolverhampton Central Reference Library L8 P462).

Phillips, J. (1868) Evidence before Select Committee on Poor Rate Assessment 1868, B.P.P. 1867-8 XIII, 211-225.

Pigot and Co. (1842) Royal National and Commercial Directory ... of ... Staffordshire, (Birmingham Reference Library).

Pirenne, H. (1914, reprinted 1967) Stages in the social history of capitalism, Am. Hist. Rev. 494-515, reprinted in Bendix, R. and Lipset S.M. (Eds.) Class, Status and Power: social stratification in comparative perspective, London, 97-106.

Pitt, W. (1817) A Topographical History of Staffordshire, Newcastle under Lyme.

Pollins, H. (1964) Transport lines and social divisions, Centre for Urban Studies 1964, 29-61.

Pooley, C.G. (1974) The influence of migration on the formation of residential areas in nineteenth century Liverpool, Paper presented to I.B.G. Historical Geography Conference, Windsor.

Poor Law Commissioners, Report 1834 Appendix B2; Answers to town queries, B.P.P. Poor Law 15, 16 (Shannon reprint 1970).

Poor Law Commissioners, Report 1834 B.P.P. Poor Law 8 (reprint Shannon 1970), 287-1239.

Popper, K.R. (1968) The Logic of Scientific Discovery, 3rd edition, London.

Pred, A.R. (1962) The External Relations of Cities During "Industrial Revolution, Chicago.

Quinn, J.A. (1939, reprinted 1961) The nature of human ecology, reprinted in Theodorson, G.A. (Ed.) Studies in Human Ecology, Evanston.

_____ (1940) Human ecology and interactional ecology, Am. Soc. Rev. 5, 713-722.

Rapkin, C. (1956) Some effects of economic growth on the character of cities, Papers and Proceedings Reg. Sc. Assoc. 2, 126-129.

Redfield, R. (1941) The Folk Culture of Yucatan, Chicago.

Redford, A. (2nd edition, 1964) Labour Migration in England 1800-50, Manchester.

Reeder, P.A. (1968) A theatre of suburbs: some patterns of development in West London 1801-1911, in Dyos, H.J. (Ed.) The Study of Urban History, London.

Rees, P.H. (1968) Factorial ecology of metropolitan Chicago, (mimeo, Chicago 1968) cited in Timms (1971) 233.

_____ (1970) Concepts of social space: towards an urban social geography, Chapter 10 of Berry, B.J.L. and Horton, F.E. (Eds.) Geographic Perspectives on Urban Systems, Englewood Cliffs, N.J.

_____ (1971) Factorial ecology: an extended definition, survey and critique of the field, E.G. 47, 220-233.

_____ (1972) Problems of classifying subareas within cities, in Berry, B.J.L. City Classification Handbook, New York.

Registrar of Births, Marriages and Deaths (1868) Supplement to 29th Annual Report B.P.P. Health, Infectious Diseases 3 (reprint Shannon 1971, 806).

Registrar General (1952) Census 1915 Classification of Occupations, H.M.S.O.

Robinson, A.H. (1956) The necessity of weighting values in correlation analysis of areal data, A.A.A.G. 46, 233-236.

Robinson, W.S. (1950) Ecological correlations and behaviour of individuals, Am. Soc. Rev. 15, 351-357.

Robson, B.T. (1969) Urban Analysis: a study of city structure, Cambridge.

Rodgers, H.B. (1961-2) The suburban growth of Victorian Manchester, J. Manchester Geog. Soc. 58, 1-12.

Rostow, W.W. (1960) Stages of Economic Growth, Cambridge.

Rowntree, B.S. (1901) Poverty. A Study of Town Life, London.

Royal Commission on Trade Unions and Other Associations, Fourth Report 1867, B.P.P. 1867 XXXII.

_____, Evidence 1868, B.P.P. 1867-8 XXXIX.

Ruskin, J. (1902-12) Works, Cook, E.T. and Wedderburn, A.D.O. (Eds.) Vol. 18 of 39, London, cited by Houghton, W.E. (1957) 190.

Ryder, N.B. (1965) The cohort as a concept in the study of social change, Am. Soc. Rev. 30.

Salins, P.D. (1971) Household location patterns in American metropolitan areas, E.G. 47, 234-248.

Sargent, C.S. (1972) Toward a dynamic model of urban morphology, E.G. 48, 357-374.

Schmid, C.F. et al. (1958) The ecology of the American city: further comparison and validation of generalizations, Am. Soc. Rev. 23, 392-401.

Schnore, L.F. (1965) On the spatial structure of cities in the two Americas, in Hauser, P.M. and Schnore, L.F. The Study of Urbanization, New York, 347-398.

Schnore, L.F. and Varley, D.W. (1955) Some concomitants of metropolitan size, Am. Soc. Rev. 20, 408-414.

Seeman, A.S. (1938) Communities in the Salt Lake Basin, E.G. 14, 300-308.

Select Committee on Poor Rates Assessment, Report 1868, B.P.P. 1867-8 XIII.

Select Committee on Poor Removals, Sixth Report 1847, B.P.P. Poor Law 20 (reprint Shannon 1970), 411-478.

_____, Report 1854, B.P.P. Poor Law 22 (reprint Shannon 1970).

_____, Report 1855, B.P.P. Poor Law 23 (reprint Shannon 1970), 9-420.

Semple, R.K. (1969) An oblique "simple structure" factor analysis of viability measures for south Ontario towns, Univ. Toronto Dept. of Geog. Discussion Paper No. 2.

Shevky, E. and Bell, W. (1955) Social Area Analysis: theory, illustrative application and computational procedures, Stanford, Calif.

Shevky, E. and Williams, M. (1949) The Social Areas of Los Angeles, Los Angeles.

Simmons, J.W. (1965, reprinted 1971) Descriptive models of urban land use, Canadian Geographer 9, 170-174, reprinted in Bourne, L.S. Internal Structure of the City, London, 128-131.

Simpson, M. (1970) Middle class housing and the growth of suburban communities in the West End of Glasgow 1830-1914, Unpublished B.Litt. thesis, Glasgow Univ.

Sjoberg, G. (1960) The Pre-industrial City, New York.

_____ (1965) Cities in developing and industrial societies: a cross-cultural analysis, in Hauser, P.M. and Schnore, L.F. The Study of Urbanization, New York, 213-263.

Smith, C.T. (1951) The movement of population in England and Wales in 1851 and 1861, G.J. 117, 200-210.

Soares, G.A.D. (1967) Economic development and class structure, in Bendix, R. and Lipset, S.M. Class, Status and Power: social stratification in comparative perspective, London. 190-199.

Spencer, K.M. (1967-8) A Social and Economic Geography of Preston 1800-65, Unpublished M.A. thesis, Liverpool Univ.

Stanislawski, D. (1947) Early Spanish town planning in the New World, Geog. Rev. 37, 94-105.

Steen and Blacket (1871) Map of Wolverhampton, (copy in Wolverhampton Central Library).

Stevenson, T.H.C. (1920) The fertility of various social classes in England and Wales from the mid-nineteenth century to 1911, J.R. Stat. Soc. 83, 401-444.

Straw, F.I. (1967) An Analysis of the Town Plan of Nottingham: a study in historical geography, Unpublished M.A. thesis, Nottingham Univ.

Sweetser, F.L. (1962) Patterns of Change in the Social Ecology of Metropolitan Boston, 1950-60, Boston.

_____ (1969) Ecological factors in metropolitan zones and sectors, in Dirgan, M. and Rokkan, S. (Eds.) Quantitative Ecological Analysis in the Social Sciences, Cambridge, Mass., 413-456.

Taafe, E.J., Morrill, R.L. and Gould, P.R. (1963) Transport expansion in underdeveloped counties, Geographical Review 53, 503-529.

Taeuber, K.E. and Taeuber, A.F. (1965) Negroes in Cities: residential segregation and neighbourhood change, Chicago.

Taylor, I. (1750) A Plan of Wolverhampton, (copy in Wolverhampton Central Library).

Theodorson, G.A. (1961) Studies in Human Ecology, Evanston, Ill.

Thernstrom, S. (1969) Immigrants and wasps: ethnic differences in occupational mobility in Boston 1890-1940, in Thernstrom, S. and Sennet, R. (Eds.) Nineteenth Century Cities, New Haven, 125-164.

Thompson, E.P. (1963) The Making of the English Working Class, London.

Thurstone, L.L. (1947) Multiple-factor Analysis, Chicago.

Tillot, P.M. (1972) Sources of inaccuracy in the 1851 and 1861 censuses, in Wrigley, E.A. (Ed.) Nineteenth Century Society, Cambridge, 82-133.

Timms, D.W.G. (1971) The Urban Mosaic: towards a theory of residential differentiation, Cambridge.

Town Commissioners, Wolverhampton 1821-48, Minutes, (Transcript by arrangement at Wolverhampton Central Library).

Treble, J.H. (1971) Liverpool working-class housing 1801-51, in Chapman, S.D. (Ed.) The History of Working-class Housing: a symposium, London, 164-220.

Udry, J.R. (1964) Increasing scale and spatial differentiation: new tests of two theories from Shevky and Bell, Social Forces 42, 403-413.

Valkonen, T. (1969) Individual and structural effects in ecological research, in Dogan, M. and Rokkan, S. (Eds.) Quantitative Ecological Analysis in the Social Sciences, Cambridge, Mass., 53-68.

Van Ardsol, M.D. et al. (1958) The generality of urban social area indices, Am. Soc. Rev. 23, 277-284.

Vance, J.E. (1967) Housing the worker: determinative and contigent ties in nineteenth century Birmingham, E.G. 43, 95-127.

_____ (1971) Land assignment in the pre-capitalist, capitalist and post-capalist city, E.G. 47, 101-120.

Veldman, D.J. (1967) Fortran Programming for the Behavioural Sciences, New York.

Vigier, F. (1960) Change and Apathy: Liverpool and Manchester during the Industrial Revolution, London.

Ward, D. (1960) The Urban Plan of Leeds and Factors Which Have Conditioned its Growth, Unpublished M.A. thesis, Leeds Univ.

_____ (1962) The pre-urban cadaster and the urban pattern of Leeds, A.A.A.G. 52, 150-166.

_____ (1968) The emergence of central immigrant ghettoes in American cities: 1840 to 1920, A.A.A.G. 58

_____ (1969) The internal spatial structure of immigrant districts in the late nineteenth century, Geographical Analysis 1(4), 337-353.

Warner, S.B. (1968) If all the world were Philadelphia: a scaffolding for urban history 1774-1930, Am. Hist. Rev. 74, 27-43.

Warnes, A.M. (1969) The Increase of Journey to Work, and its Consequences for the Residential Structure of Towns with Special Reference to Chorley, Lancs., Unpublished Ph.D. thesis, Salford Univ.

_____ (1972) Residential patterns in an emerging industrial town, Paper presented to I.B.G. Urban Study Group Conference Social Patterns in Cities, Aberystwyth.

Weber, A.F. (1899) The Growth of Cities in the Nineteenth Century: a study in statistics, (reprinted New York 1963).

Williams, K. (1971) Do you sincerely want to be a factor analyst?, Area 3(4).

Wilson, G. and Wilson, M. (1945) The Analysis of Social Change, Cambridge.

Wingo, L. (1961) An economic model of the utilization of land for residential purposes, Papers and Proceedings Reg. Sc. Assoc. 7, 191-205.

Wolpert, J. (1966) Migration as an adjustment to environmental stress, J. Social Issues 22(4), 92-102.

Zimmer, B.G. (1955) Participation of migrants in urban structures, Am. Soc. Rev. 20, 218-224.

Zorbaugh, H.W. (1926) The natural areas of the city, Publs. Am. Sociol. Soc. 20, 188-197.